USAID FIRMS PROJECT

Fisheries Rapid Market Appraisal for Sindh

September, 2014

This publication was produced for review by the USAID. It was prepared by Dr Nasim Akhtar and Zeevar Scheik for an assignment commissioned by Chemonics International under the USAID Firms Project.

USAID FIRMS PROJECT

Fisheries Rapid Market Appraisal for Sindh

Data Page

Contract Number:	GBTI II Task Order No. EEM-4-07-07-00008-00
Contractor Name:	Chemonics International, Inc.
Name of the Component:	Business Enabling Environment (BEE)
USAID Technical Office:	Office of the Economic Growth and Agriculture; USAID Pakistan
Date of Report:	September 24, 2014
Document Title:	Fisheries Rapid Market Appraisal for Sindh
Author's Name:	Dr Nasim Akhtar and Zeevar Scheik
Editing:	Zehra,M.
SOW Title and Work Plan & Action ID:	Fisheries Rapid Industry/Market Appraisal, 2289 Work Plan Level 33500 Action ID 7331
Project Area:	Sindh; Islamabad, Pakistan
Key Words:	Aquaculture, Capture, Fisheries Marine, Inland, Value Addition

Abstract:

The fisheries and aquaculture sector has immense potential for development in Sindh, as compared to other parts of Pakistan. Presently the sectoe supports the livelihoods of about 1 million fishermen inhabiting mostly the rural areas around rivers, main water bodies and all along the coastal areas of Sindh and Baluchistan. The sector contributes about 1% to the GDP of the country and by late March 2014, fish exports were reported to have crossed an all-time high annual mark of USD 320 million. The bonus for Pakistan's fish marketing efforts has been the reopening of fishery export trade with EU member countries after a hiatus of almost 7 years The fish export industry has carved a niche in a number of new markets , particularly in the Near East and Far East. Provided that sufficient catch continues to be available to create an export surplus and the products meet international compliance standards and good practices, Pakistan can add several outlets in established markets worldwide to the list of importers. While the fisheries sector is estimated to have an annual potential value of well over US$ 1.5 billion, the overall performance is not very encouraging. Stakeholders have been unable to promote and modernize various sub sectors within the fisheries, particularly aquaculture. Management-wise, marine fisheries have two dimensions, fisheries within territorial limits and beyond national territories into the EEZ. Inland capture fisheries are provincial subjects while deep and open sea fisheries fall within the jurisdiction of the federal government, which regulates the fisheries in these areas through its Marine Fisheries Department. The inland capture fisheries is characterized by the gigantic canal system created by regulating the river Indus system through a series of head works and barrages. Flowing from the plains of Sindh, the Indus river system ultimately drains into the Arabian Sea after creating the massive delta in coastal region of Sindh. The lakes and reservoir fisheries are the mainstay of capture fisheries in Sindh; however, there is a constant decline in fish landings both from marine and inland capture fisheries. The aquaculture is, relatively speaking, a new activity in Sindh like other parts of Pakistan despite huge existing potential for development. The development of aquaculture gains more importance in the face of declining catches from the natural water bodies in Pakistan. The institutional framework, regulatory structures and organizational capacity need to be stream lined if the role of fisheries is to be appreciated towards bridging the protein deficiency gap for the local population. The market structure and marketing system are not well organized and the relevant infrastructure to support the supply chain needs immediate and rational development. Given its economic role, a number of international organizations and NGO's have been consistently supporting the fisheries sector but piece-meal. There exist inter- as well as interprovincial variations in the level of technologies available and the way the way new technologies are adopted mainly because of a dearth of trained manpower. All these indicators point out that a very serious and concerted effort is needed to gather first-hand information on both the supply side and demand side of this sector in Sindh, particularly in the perspective of the pace of development in other provinces, especially Punjab where, relatively speaking, the fisheries and aquaculture sector is known to be better developed. In this backdrop, information regarding the fisheries sector including the production industry, the value chain and marketing of fisheries is deemed necessary for understanding its current status logically if at all a real and rational interventions both on the supply and marketing side is to be pursued for Sindh.

In the above stated context, the objective of the current studies were to provide a rapid appraisal of marketing and industrial side in all three forms of fisheries as is found in Sindh , viz, capture inland fisheries, coastal marine fisheries and aquaculture. This report gives its findings of the studies conducted for the appraisal of industrial and marketing subsectors of fisheries in Sindh along with provision of a set of doable interventions both in long as well as short terms.

The study results take into account the associated value chains so as to elaborate the current status of fisheries industry. The findings provide both a qualitative as well as quantitative.

Basis for building and proposing interventions along with identification of impacts created thereof. In brief, the report provides a pathway for developing a legal framework for the fisheries sector in Sindh, without losing site of the prevailing limitations to the developmental process.

Acronyms

BEE	Business Enabling Environment
EEZ	Exclusive Economic Zone
FDS	Fisheries Department, Sindh
GDP	Gross Domestic Product
KPK	Khyber Pakhtunkhwa
LBOD	Left Bank Outfall Drain
M&E	Monitoring and Evaluation
RBOD	Right Bank Outfall Drain
SME	Small and Medium Enterprises
SMEDA	Small and Medium Enterprises Development Authority
SOW	Scope of Work
US	United States
USAID	United States Agency for International Development
USD	US Dollar

Table of Contents

List of Tables

List of Figures

Executive Summary

As a sub-sector, the fisheries sector in Pakistan is estimated to contribute about 1 percent to GDP and fisheries and allied industries are estimated to support the livelihoods of about 1 million fishermen living in rural villages. Most of the economics associated with the coastal regions of Pakistan center around fishing / forestry and related businesses. Yet, despite several initiatives designed to promote and modernize both the inland and marine fisheries sector, stakeholders have been unable to exploit the full potential of improving productivity and profitability.

Yet, the Fisheries sector has registered a decrease in productivity and suffers from a lack of capacity amongst the public and private sector to manage production and marketing of fisheries, Particular issues remain overexploitation, and unhygienic conditions across the supply chain ranging from the conditions of fishing vessels and conditions at landing sites, to conditions in processing establishments. Additionally a number of issues such as environmental degradation and gender equity remain questions marks affecting competitiveness in terms of achieving international compliance.

According to the current study findings, all subsectors of fisheries have their own characteristics and issues thereof affecting their potential role in provincial/national economy.

It was found that overall the fisheries sector suffers from a serious lack of management and recognition of its economic importance amongst-decision makers. Little investment is made in terms of developing and improving fisheries management plans, infrastructure development and sustainable fishing practices. Analysis of available data clearly indicates that fisheries and aquaculture is still an industry that generates billions of rupees annually despite the decline in fisheries resources as a consequence of over-fishing, insufficient release of fresh water in the Indus River, cutting of mangrove forests, and lack of fish stock. Pakistan's fishing industry is a growing sector and in order to develop the industry further and obtain a larger share in the world market it has been identified that a strategy has to be put into place to 'add value' to product and process alike.

Critical areas of concern of marine coastal fisheries resources in Sindh were found to include consistently declining stocks, unchecked over fishing, use of illegal / unfriendly nets, increasing fleet size (open access fisheries), mechanization of boats meaning better harvesting opportunities, habitat destruction mangrove denudation, unabated pollution,

With regard to Inland Fisheries, in Sindh, there are 1209 fishing waters, including ponds, depressions, reservoirs, canals and Indus River and fishermen and all other stakeholders depending on ancillary business related to fish as source of their livelihood fetch their incomes from these natural fishing grounds of the province. About 64 percent of the country's inland fish production share was contributed by Sindh province. In view of the resources endowed to the province (*i.e.* Indus River, canal networks, reservoirs, lakes, stream, water logged area and village ponds) fish production share can be increased up to 90 percent with proper use of these resources.

The aquaculture sector in Pakistan has also been growing steadily but at a slower pace despite Fisheries and aquaculture sector in Pakistan receiving less priority in policy planning and public investment.

Pakistan's aquaculture sector witnessed only two mega projects (funded by Asian Development Bank) both completed. Most of the current infrastructure in the Punjab, KPK and Sindh was developed under these two projects but neither Baluchistan nor Gilgit Baltistan (GB) were

included in the work plan of those projects. Recently another project titled Aquaculture and Shrimp Farming was initiated by the federal government but was closed prematurely due to Devolution.

An in-depth analysis clearly indicates that the sector utilizes only around 1 percent of the available water resources. Waterlogged areas (56 percent) and flood water areas (18 percent) provide a haphazard fisheries production given the millions of hectares of waterlogged areas created due to massive irrigation systems, and as per one of FAO's finding practically no attempt has been made to use these water bodies for fish culture. Careful planning is needed for judicious use of these underutilized areas for productive fish farming. The situation is further aggravated by the fact that the average growth of aquaculture area and production are divergent to each other as far as the Sindh province (which hosts around two thirds of fisheries resources) is concerned.

It is of note that despite a ban by the EU in 2007, and the loss the EU as a market, the number of persons employed increased between 2007 and 2009 and it can be estimated that over a lakh people were employed in the sector. Sample interviews with communities however revealed that fishing was not a stable income and that they also would like to be inducted in alternative livelihoods and other opportunities e.g. search and rescue operations and lifeguard duties in which they are informally involved.

The role of women in the sector wavers to extremes. There are also conflicting views regarding their involvement ranging from voluntary abstention to enforced abstention There is no involvement of the women in fisheries at the expedition level and at the processing level, the role is limited to low-skilled routine processing tasks or processing in difficult work environments. For instance, women workers peel/clean the ice-covered shrimps, fish and crabs with their bare hands and without any safety equipment or any hygienic environment for personal sanitation.

Going forward recommendations for next steps in the sector include, a two -pronged strategy to promote and develop value added products in Pakistan including the following:

- Use of fish oil based by-product as raw material in pet food industry.
- Refinement of crude heat-treated fishmeal oil, currently obtained while preparing fish meal
- Block processed sardines for export in human consumption sector, (de-headed and de-tailed or whole-fish)
- Canning large sized sardines in oil, especially in Gwadar because of availability of high quality sardines from pollution-free waters.
- Product development from deboned minced white fish such as ribbon fish and bream
- Supply of minced fish wastes in frozen bulk for mink-feed and pet-food
- Drying of fish for Nigerian human consumption markets
- Smoking fish (cold smoked) such as Mackerel, Tuna etc.
- Feasibility of using Squids for fishing bait especially in Norway , Iceland or for sport fishing
- Crab and Prawn shell based chitin / chitosan products

Infrastructure and regulatory improvements include improvements to the local fish harbor /ports. The FDS must prepare an overall master plan for Fisheries Management in riverine and reservoirs system of Sind along with a contingency plan for fisheries managers.

A Centralized statistics collection system needs to be established to provide time-series of data for rivers, streams and reservoirs/lakes for assessment, evaluation and examples of the level of efficiency of the applied enhancement measures.

A Master plan for developing market infrastructure should be developed by highly skilled Fish Market specialists. Additionally Trade related development is essential for development of export. The Concept of “Trade Corridor” approach needs to be developed with one widow operation from a designated port. Ideally to implement this approach, The BOI should work towards developing the first ever National Fisheries Trade Corridor” at the Korangi Fish Harbor on the lines of one recently developed in Indonesia.

And finally, recommendations for the improvement of women’s conditions would require the Formation of WCOs (Women’s community Organization’s and Training to look at local issues such as healthcare and education, Vocational training in handicrafts and other means of income and Skills training for women factory workers and also for alternate livelihoods for the fishermen.

1. Introduction

1.1 Background

The Islamic Republic of Pakistan, comprises four provinces — Sindh (capital, Karachi), Punjab (capital, Lahore), Khyber Pakhtunkhwa (formerly the North-West Frontier Province) (capital, Peshawar) and Baluchistan (capital, Quetta). All four provinces have their own elected provincial assemblies and governments, while Islamabad is a special 'Federal Capital Territory'.

The Federal Government also administers seven tribal agencies (Bajaur, Khyber, Mohmand, Kurram, Orakzai, South and North Waziristan) and six frontier regions which are collectively known as the Federally Administered Tribal Areas (FATA).

Additionally, Pakistan administers approximately one-third of the area of the former princely states of Jammu and Kashmir and Gilgit-Baltistan, which have their own elected parliaments and governments.

Pakistan's possess a coastline is 990 km long, which with an Exclusive Economic Zone (EEZ) covers an area of about 240,000 sq. km. The maritime zone of Pakistan, including the continental shelf, extends up to 350 nautical miles from the coastline. The shelf of the coast is dominated by the Indus (a major river of Pakistan) canyon. The continental shelf varies in size distinctly along the Sindh and the Baluchistan provincial coasts.

The seaward coastal zone up to 12 Nautical Miles (NM) from the coastline comes under the jurisdiction of the Sindh and Baluchistan provinces.

The coastal zone beyond the 12 NM up to 24 NM is the contiguous zone and beyond the 12 NM up to 200 NM is under the jurisdiction of the federal government.

The protection and conservation of the coastal resources is the responsibility of the federal government, which also has the authority for legislation and its enforcement within a 3 mile limit of the ports and within the 12 to 200 NM of the EEZ.

Pakistan's population is currently estimated as over 162 million, with a rural-urban divide of 60-40 i.e. over 60 percent rural. Urban population increased to 69.87 million (2012-13) from 67.5 million in 2011-12 while the rural population has increased to 114.4 million (2012-13) from 113.1 million in 2011-12 (Eco Survey)

World Bank performance reviews indicate that Pakistan's economy has traditionally under-performed in terms of economic growth and social development, as compared to other countries at similar levels of per capita income. The most recent Pakistan economic survey estimates during the last five years the economy of Pakistan grew on average at the rate of 2.9 percent per annum.

Pakistan's economy is made up of the services sector (50 per cent), industry/manufacturing (25 per cent) and agriculture (25 per cent).

The agricultural sector is a cornerstone of the economy, accounting for up around 21.4 percent of GDP, and 57 per cent of export earnings, with around 45 per cent of the country's population depending directly or indirectly on agriculture for their livelihood. The agriculture sector consists of sub-sectors, which include crops, livestock, fisheries, and forestry. The crop sub-sector is further divided into important crops, other crops and cotton and ginning. Livestock share in agriculture is 55.4 percent.

The fisheries sector in Pakistan is concentrated in shallow coastal waters, the estuarine system of Indus and associated creeks and to a lesser extent, in the deeper part of the ocean. A major

part of the fishing fleet of Pakistan confines its activity to coastal waters up to 20 – 25 miles from the coast due to lack of adequate navigational aids and small sized fishing crafts with practically no storage / catch preservation facilities.

The second largest sector, manufacturing is concentrated around the Karachi-Hyderabad region in Sindh and in Lahore, Punjab, however is constrained by chronic energy shortages. It is estimated that GDP growth has been stuck at a level, which is half of the level of Pakistan's long-term trend potential of about 6.5 percent per annum.

About 70% of the total industry of Pakistan is located in Karachi, Sindh, The major industry comprises of textiles, chemicals, pharmaceuticals, electronic goods, food, oil refineries, tanneries, iron and steel, and thermal power generation.

The services sector has 57.7 percent share in GDP and has emerged as the main driver of economic growth. The services sector consists of the following sub-sectors: Transport, Storage and Communication; Wholesale and Retail Trade; Finance and Insurance; Housing Services

(Ownership of Dwellings); General Government Services (Public Administration and Defense); and other Private services (Social Services).

The country's total labor force increased to 57.24 million in 2010-11 as compared to the preceding year of 56.33 Million. The total number of people employed during 2010-11 was 53.84 million, 0.63 million more than the preceding year. Total unemployment rate increased to 6.0 percent in 2010-11 with the number of unemployed people increasing from 1.94 million to 2.1 million in Punjab, in Sindh from 0.57 million to 0.70 million. In KPK however the unemployed people decreased from 0.55 million to 0.53 million and in Balochistan unemployed people increased from 0.06 million to 0.07 million in 2010-11.

Economic recovery was set-back by the 2010 floods, exacerbated by exogenous factors such as hikes in global food and fuel prices which increased the inflation rate to above 14 percent between August 2010 and February 2011.

Primarily an agrarian and agri-business based economy, followed by manufacturing, and services, the 2010 flood led to negative or negligible growth in all three sectors. The destruction of key crops during the floods led to a negative growth of 4% in the agricultural sector alone. Deterioration in the power sector is the main constraint on growth. Power outages have shaved off annual GDP growth 2 percent. GDP growth has been stuck at a level, which is half of the level of Pakistan's long-term trend potential of about 6.5 percent per annum.

1.2 The Program

The objective of USAID's Pakistan FIRMS project is to strengthen the capacity of the country's private sector. The project works to improve government service delivery and developing internationally competitive firms to accelerate sales, investment, and job growth, and produce high value-added products and services, to undercut the basis for extremism.

The project has dual components designed to enhance economic growth, specifically business enabling environment and value chain development.

The business enabling environment component aims to improve the capabilities of government, primarily at the district level, to accelerate and facilitate economic opportunity in vulnerable districts. To achieve this component, the project supported agricultural produce market reforms and livestock sector reforms across Punjab, Sindh, Khyber Pakhtunkhwa, and Baluchistan provinces.

The primary focus of the value chain development component is development of sales opportunities for private businesses in select value chains. The project liaises with government,

primarily through the business enabling environment component, and works directly with local industry, as the private +sector has the most potential to generate economic growth.

Acknowledgements

Many professionals contributed in so many ways to the completion of this report. The assignment was carried out through close interaction with the senior policy Advisor Mr. Suleman Ghani and very close interaction and supervision of Deputy Component Leader, Business Enabling Environment Dr. Asif Chishti. The consultants are extremely grateful for their immensely valuable contributions.

2. The Present Study

From capture to consumption, GDP, disposable income, levels and use of consumer credit and inequality of wealth are cited as key components affecting the fish supply chain. In developing countries, fish also plays a major role in the diet of poorer communities as a principal source of protein.

Broadly, speaking LDCs are producers, while developed countries constitute the main outlets for fish and fishery products. Japan, the largest single market for fish and fishery products and their high level of per capita fish consumption places year round demand. United States plays an important role as second largest single country market with growing potentials. Japan's declining fish consumption followed by low demand on high valued species affects the trade flows to other growing markets. In particular, growing economies and expanding upper middle class in Asia places high demand on fish and fishery products.

2.1 Purpose of the Rapid Mark Industry Appraisal

As a sub-sector, the fisheries sector in Pakistan is estimated to contribute about 1 percent to GDP and Fisheries and allied industries are estimated to support the livelihoods of about 1.0 million fishermen living in rural villages. Most of the economics associated with the coastal regions of Pakistan center around fishing / forestry and related businesses.

Yet, despite several initiatives designed to promote and modernize both the inland and marine fisheries sector, stakeholders have been unable to exploit the full potential of improving productivity and profitability.

Even though Pakistan's export earnings amounted to US$ 320 million in 2013, it is a mere fraction of the potential of the sector to generate earnings in excess of US$ 1.0 billion.

While the Marine Fisheries outside the territorial limit of the provincial government are a federal subject under the purview of the Marine Fisheries Department (MFD); coastal and inland fisheries, which contribute nearly 50 per cent to sector GDP, are a provincial subject managed by the Sindh Department of Livestock and Fisheries (DOF) which is also responsible for the promotion and management of aquaculture as well as enhancing fish production through stocking of fish seed in natural as well as in man-made reservoirs, dams and other water bodies.

The Fisheries sector has registered a decrease in productivity and suffers from a lack of capacity amongst the public and private sector to manage production and marketing of fisheries, particularly overexploitation, and unhygienic conditions across the supply chain ranging from the circumstances at fishing vessels and conditions at landing sites, to conditions in processing establishments.

Information regarding the fisheries sector including the production industry, value chain and marketing of fisheries is necessary for understanding their current status in order to reorganize the industry and markets for increased efficiency.

Preliminary surveys of market structure and working of fisheries sector have not revealed any innovative fisheries industry or market structure. Further, outdated legislation is unable to protect the rights of fishermen and small tribes earning livelihood as producers. Influential players in the market exploit the situation in their favor and fishermen do not get fair returns.

There is a need to pave the way for an efficient market structure and best practices, which could bring positive change in the fisheries sector.

The objective of the rapid industry / market appraisal was to assess the fisheries sector in Sindh and the associated value chain in order to benchmark the on-ground status.

Additionally the study aims to establish a quantitative and qualitative basis for building and proposing interventions while analyzing the impact of the same on the fisheries sector. This will further be used for drafting an institutional and legal framework for the fisheries sector.

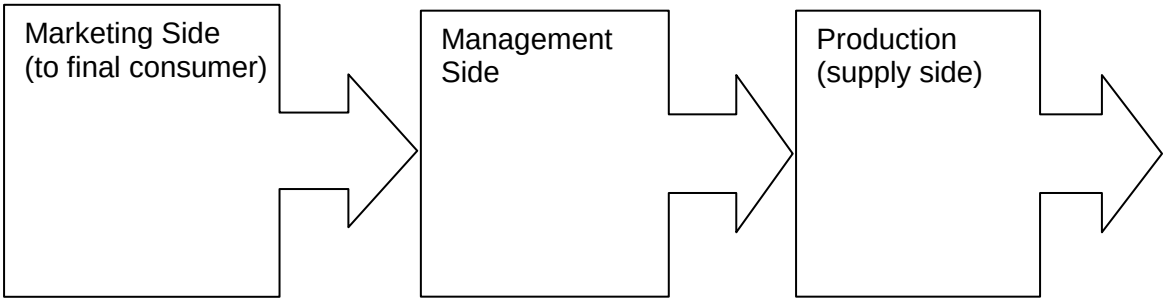
2.2 Objectives of the Study

The objectives of the study were to conduct sectoral analyses of the fisheries sector / industry / markets in the Sindh province with view to achieving the following overview:

1. Quantification of existing infrastructure, business processes, institutional arrangements, human resources, financial capacity, and other indicators found therein
2. Identification of various formal and informal stakeholders in the fisheries sector
3. Analysis of stakeholder impact/ influence on the market chain, value chain and sector as a whole.
4. Incorporation of a gender –based review of the fisheries sector
5. Identify gaps, existing deficiencies and distortions in current practices and determine whether they are conducive to enabling the fair, efficient, and growth-oriented functioning of fisheries sector / industry / markets
6. Determine time and cost to private sector and public sector based on current policies and practices
7. Identify the sources and amount of revenue over the past five years and determine their utilization
8. Identify the needs and concerns of all players including but not limited to suppliers and buyers based on their perceptions and enlist their recommendations for the improvement of situation.

2.3 Scope of the Rapid Fisheries Market and industry Appraisal in Sindh

The below diagram (De Silva) captures a typical fisheries Value Chain as



The present Rapid Market/industry Appraisal has endeavored to illustrate this for the Sindh fisheries sector through an analysis of Frameworks, Market and Supply and value Chain, SPS, Environmental and other factors and Livelihoods.

Based on the above, this study has been structured to underline the value chain analysis providing both qualitative and quantitative background information for analysis that has been drawn from the secondary data, published or unpublished literature, surveys, focus groups, and rapid appraisal. The Following scheme for determining the value chain as proposed by Bjørndal (2010) has been followed.

The report has therefore been structured depicting value chain analysis including sections on the Production/Supply side as well as the Demand side and is structured to include, in three sections separately (one for Capture Marine/coastal fisheries; the second covering Inland Capture fisheries and the third section to cover Aquaculture) the following stages in the supply chain:

1. Production: capture fishery or aquaculture (supply side for industrial output).
2. Processing: (including distribution / transportation).
3. Management/regulations
4. Market structure, marketing chains and margins (demand side)

This background analysis will be qualitative and partly quantitative. The purpose is to give the reader a good understanding of the relevant supply/value chain. It will also be important for interpreting the results from the econometric analyses and relative or comparative analysis drawing inferences from various types of fisheries and aquaculture existing in the province of Sindh as given in the following section.

2.3.1 Types of Fisheries in Sindh, Pakistan, catering to the supply side

Fisheries in Pakistan, and for that matter in Sindh, can be classified into three broader groups viz; capture fisheries, Aquaculture (and-based) Mariculture and going further down the line , can be rationally segregated into following subsectors.

2.3.2 Capture Fisheries

The salient features of five types of capture fisheries sector which have been found to exist in Pakistan are below; (the first four types pertain to marine capture fisheries sector).

2.3.3 Small-Scale Fishery:

The tuna is captured by gill nets. A large share of the catches is exported through informal channels as fresh products mainly to Iran, where it is used as a raw material for the canning industry. A smaller share is exported to other regional markets as dried and salted products. The small-scale tuna fishermen also capture other species such as marine jewfish, croakers, grunters, snappers, groupers, ribbonfish and pamphlets.

2.3.4 Shrimp Fishery:

Almost all of the shrimp trawlers are equipped with winches for hauling nets. However, shrimp is also caught by cast nets in shallow depths from October to March. Shrimp are also caught in estuaries and brackish waters from July to September. The shrimp by catch provides raw material for the fishmeal industry, which consists of mostly small fish species but also immature larger species that would otherwise have been valuable for exports.

2.3.5 Deep-Sea Fishery:

Deep-sea resources remain comparatively unexploited because local vessels are neither suitable nor equipped for deep-water fisheries. The country has thus opted to allow foreign flag vessels to operate in deep-sea waters, but due to a lack of interest by international bidders this scheme has been inoperative for almost 7 years now.

2.3.6 Small-Scale Pelagic Fishery:

The pelagic fishery is mainly targeted towards catches for industry. This fishery is operating in Sindh province, using special nets, locally termed *'katra*'. Fishing is carried out from '*hora'* boats in depths shallower than 20 m, shoals of clupeids, especially the Indian Oil Sardine, are targeted species for catch.

2.3.7 Inland Capture Fisheries

The Indus River system and its allied system is the world's largest canal irrigation system, with manmade reservoirs, including both large and small dams as well as natural lakes (most of the largest of these situated in Sindh). This provides the bulk of freshwater catch in the country. The Inland Capture fish produce is mostly consumed locally and during the next decade the same trend is expected to continue, with the inland population of the country expected to consume any increased fish production achieved through fisheries either from capture /wild caught fisheries or aquaculture. Unlike marine fisheries products, the major chunk of which goes into the fishmeal industry and is thus not available for human consumption, the freshwater fish caught from inland water are known to be consumed to the level of over 95 per cent or even more as there is no wastage or trash fish.

2.3.8 Aquaculture

In recent years, the biodiversity of natural freshwater water bodies and coastal areas has been seriously affected as a result of overfishing, pollution and environmental degradation. This necessitated the development of aquaculture sector. The main objectives for aquaculture development have largely been based around food security, improvement of farm incomes from marginal lands not suitable for agriculture, poverty alleviation, increased export earnings and employment generation especially as a means to absorb excess rural labor.

Aquaculture is also seen as a means of filling the gap between supply and demand for fish products that cannot be met by the fisheries sector, which is either stagnant or on a decline. Inland fish production is mostly consumed locally and during the next decade the same trend is expected to continue, with the inland population of the country expected to consume any increased fish production achieved through aquaculture. However, any production as a result of the coastal aquaculture of high value shrimp and finfish species would be expected to contribute towards the export earnings of the country.

2.3.9 Mariculture

Pakistan has yet to venture in Mariculture sector on commercial /pilot scale despite that Sindh Fisheries Department has tried several attempts on trial basis to initiate pen culture of fish at KT Bunder and other selected sites in the past years.

3. Study Methodology

3.1 Structure and Work Plan

The study was led by a team comprising a legal expert and fisheries technical expert working under the supervision of the project. Based on literature review, the study focused on the marine fisheries sector as well as the inland fisheries sector using both literature review, and site surveys and visits.

The Study methodology comprised the following:

- Conducted a desk review of the fisheries and aquaculture sector of Sindh particularly

  Consulting documentation and policies covering, technical, legal/regulatory issues , and relating to the institutional and stakeholder landscape of the sector.

- Consultation of stakeholders drawn from the relevant departments concerned with the Fisheries sector, other agencies and other public entities, development assistance agencies, projects, and national and international NGOs.
- Consultation of private sector stakeholders, including fishermen and boat owner associations, processing and marketing ventures, civil society and academia etc.
- Review and Discussions with the International Consultant

Survey for Market and Data capture. The field interviews and surveys/ meetings were arranged at individual levels and at group levels with stakeholders of fisheries and aquaculture sector representing private sector, provincial, area governments, and other organizations. The aim of the consultation was to take a fresh insight of the sector, prepare a list of prioritized activities and interventions so that international donor agencies such as USAID can have a firsthand report as reference for developing a plan of action in the identified areas of concern and development in both fisheries ad aquaculture sub sectors of Sindh.

3.2 Limitations of the Study

A number of factors were identified as constraints during the data collection along with its limitations. One of the key limitations of the study was the dearth of information available on a number of parameters. A number of factors were identified as constraints during the data collection along with its limitations including a paucity of information available on the role of women in the sector and work-force. Moreover, the study was conducted during a season when there was a ban on catches and, there was little to very slow activities at fish harbor.

4. Study Findings

SECTION I:

Marine / Coastal Fisheries

The northwestern region (or Makran Coast) extends from the Hub River to the Iranian border, which is about 772 km long. The entire shelf area of this region comes to about 14 530 km2. The bottom is generally rocky and the shelf is uneven. On the other hand, the southeastern region (or Sindh Coast) is 348 km long and extends between the Pakistan-Indian border and the Hub River. The bottom is generally sandy or sandy-muddy.

Marine Resources	Area
a) Pakistan (sq. km)	
Continental Shelf	50,270
Exclusive Economic Zone	240,000
Total Marine	290,270
b) Sindh (ha)	
Territorial Marine Waters (Km)	352km X 12 N. miles
Deltaic Area	700,000
Waterlogged areas	200, 000 acres

A. PRODUCTION— THE SUPPLY SIDE

4.1 The Marine Resource; the Context of Sindh and Makran Coast, Deep Sea Fishing and Joint (Common) Exclusive Economic Zone

Pakistan has a coastline of about 120 km, with a number of bays and broad continental shelf lying in front of the Indus deltas which are ideal for growth of marine life. The Exclusive Economic Zone of Pakistan extends up to 200 nautical miles from the coast. Most of the marine catch is done within 12 nautical miles. Based on topographical features and productivity, the coast is divided into two zones, i.e. the northwestern region or Makran coast, and the southeastern region or Sindh coast. Major fish centers are Karachi on the Sindh coast and Gwadar and Pasni on the Makran coast.

The shelf area is about 35 740 km^2. The shelf in most areas in the Indus delta region extends up to 80 miles. The region, unlike Baluchistan, is characterized by a network of creeks having mangroves that serve as a nursery ground for finfish and shellfish resources.

4.2 Overall Role of Fisheries Sector In the Economy- An Analytical Approach

Fishery is an important sub- sector of agriculture, in Sindh province especially. It occupies a very important place in the socio-economic development of the country. It has been recognized as a powerful income and employment generator as it stimulates growth of a number of subsidiary industries and is a source of cheap and nutritious food besides being a foreign exchange earner.

Most importantly, it is the source of livelihood for a large section of the economically backward population of the coastal areas; also along the banks of much regulated river system, which comprises headways/barrages made for diverting waters for irrigation in the world's largest canal irrigation system of the Indus River System.

According to the current study findings, all subsectors of fisheries (described earlier in this report) have their own characteristics and issues thereof affecting their potential role in provincial/national economy. It was found that overall the fisheries sector suffers from a serious lack of management and recognition of its economic importance amongst-decision makers. Little investment is made in terms of developing and improving fisheries management plans, infrastructure development and sustainable fishing practices. Analysis of available data clearly indicates that fisheries and aquaculture is still an industry that generates billions of rupees annually despite the decline in fisheries resources as a consequence of over-fishing, insufficient release of fresh water in the Indus River, cutting of mangrove forests, and lack of fish stock.

The increasing role of this sector in both the provincial and national economy can be gauged by looking into the increase in overall fish production which for various reasons has grown more than ten-fold, and increase in inland production of more than twenty-fold over the last 60 years. As a result of this exhaustive production increase, key species resources (particularly shrimp) have been severely depleted in both coastal waters and to some extent, in the inland sectors. The center of fishing activity in the coastal waters has remained in the area between 12-35 nautical miles. The areas beyond and deep-sea fishing has largely been under-utilized due to the lack of modern fishing fleet with the equipment necessary to exploit these areas. Measures introduced to reduce the coastal water overexploitation and arrest economic deterioration, include seasonal closures for shrimping and fishing, reduction in boat numbers and encouraging diversification of activity into the less exploited fisheries. Despite declining capture fisheries and dwindling resources, one cannot ignore the significance of the sector for its contribution to the national economy, contributing about one percent to GDP and providing jobs to about one percent of the country's labor force. (It is estimated that 400 000 fishermen and their families are dependent on the fisheries sector for their livelihood.).

The sector's contribution to the country's export earnings is substantial. Fish and fishery products valued at US$ 320 million were exported last year and the reports so far, from this year's exports show a growing trend in the value being earned from fish exports. The opening of the EU Market after a lapse of seven years, in 2013, could be one of the augmenting factors for boosting our revenues from fish exports.

BOX 1

In the past, fishing in Sindh was predominantly concentrated on shallow water coastal stocks. Trawling for shrimp was the main commercial fishing activity. Because of uncontrolled increases in the shrimping fleet, its resources have severely been depleted and there is a general fear that these fisheries, which are the mainstay of exports from Pakistan, may collapse in the near future. Considering this, some management measures for the conservation of our shrimp stock, as per the suggestions of fishery biologists, are being taken such as (i) imposing a two months ban on shrimping during May-June (though sometimes it is reduced to one month due to the pressure of fishermen on political government); (ii) reduction in number of trawlers; and (iii) diversification of fishing efforts. Gillnetting and long lining in comparatively deeper water is recommended for diversification of shrimp trawlers. This diversification has picked up pace. It is estimated that at least 300 shrimp trawlers have been converted into gillnetters/long liners. Presently about 18000 boats are involved in fishing in the coastal waters of Sindh and Baluchistan.

The sector's developmental profile in the past years is indicative that with different levels at different times and during different regimes, the Government has generally has not taken much interest in the development of the fisheries sector of Pakistan, especially in Sindh.

In the past we have seen that considerable emphasis has been given to strengthen the fisheries infrastructure, enhancement of fish production, increase in export earnings as well as domestic consumption of fish, diversification of fishing effort, exploitation of hitherto untapped resources and, to some extent, improving the socio-economic condition of the fishing communities. All these factors, contributed towards reaching to a fish production mark of 700,000 tons in 2013-2014 with one -fourth of this overall production coming from inland sector of which Aquaculture contributed about half of the total production. (figure 1)for comparison purposes, it is noted that in 1947 after Pakistan gained independence, the overall fish production of then West Pakistan was 39343 tons of which the marine sector contributed 32893 tones while inland resources contributed only 7050 tones reportedly.

It needs to be noted that all aquaculture in Pakistan is so far land based and practiced only with freshwaters. The details and comparative account of production trends over the past years is given in the figure below. (Calculated and graphed by authors based on national economic survey and Statistical Handbook of Pakistan.)

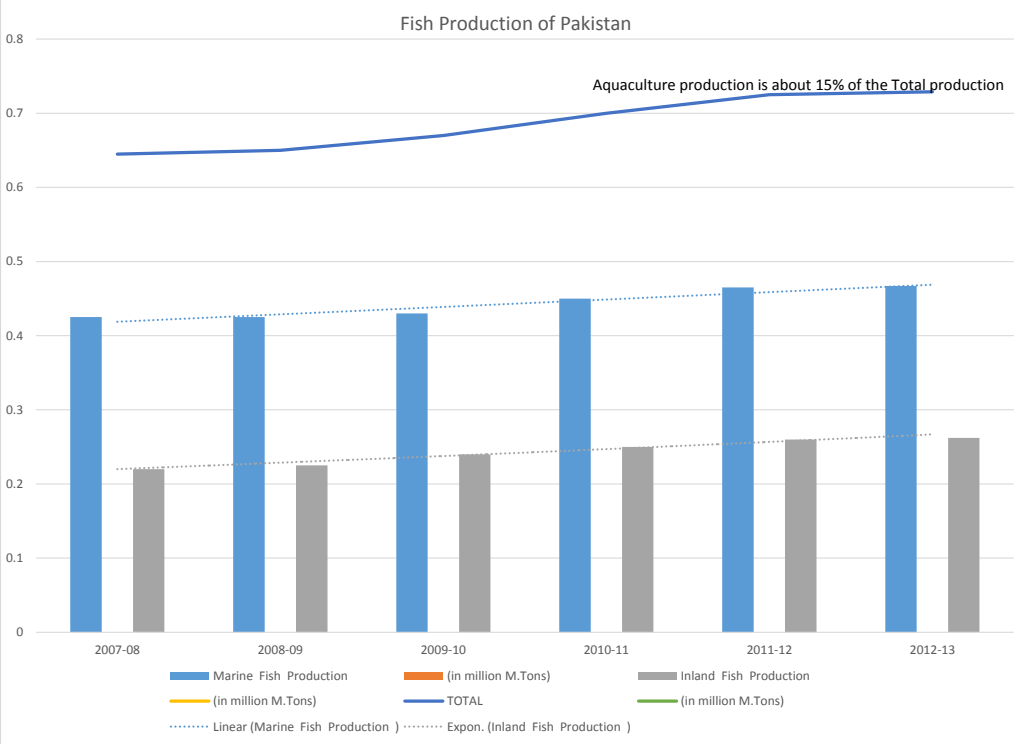


Figure 1 Fish Production of Pakistan

The contribution of the fisheries sector to the country's export earnings is predominantly from the Sindh coastal water although Makran coast also has a share in country's export though very nominal. More over the export is of mainly unprocessed marine fish shell fish and to some extent while contribution of inland fisheries towards country's export is negligible to bare minimum. The export of Aquaculture products is yet to start but it needs a firm footing to start for meeting the compliance issues and competitiveness .in the international markets. With the natural fisheries resources showing a declining trend in catches the ray of hope exists with aquaculture for which immense potential exists.

This is more so on the face of fact that biodiversity of natural water bodies and coastal areas has been seriously affected as a result of overfishing, pollution and environmental degradation. Aquaculture sector, however needs to be developed rationally and on sustainable lines learning lessons from the negative impacts of environmental degradation which may ensue. Also, in order for objectives for aquaculture development to be developed around food security, improvement of farm incomes from marginal lands not suitable for agriculture, poverty alleviation, increased export earnings and employment generation especially as a means to absorb excess rural labor.

Aquaculture is also seen as a means of filling the gap between supply and demand for fish products that cannot be met by the fisheries sector which is either stagnant or in decline. Inland fish production is mostly consumed locally and during the next decade, the same trend is expected to continue, with the inland population of the country expected to consume any increased fish production achieved through aquaculture. However, any production as a result of the coastal aquaculture of high value shrimp and finfish species would be expected to contribute towards the export earnings of the country.

4.3 The Institutional Framework and Its Complexity for Sustaining Yields

The Fishing within territorial waters (up to 12 nautical miles) is basically a provincial responsibility thereby the Sindh Fisheries Department is responsible for the overall fisheries management of Sindh Coastal area and its fisheries within 12 nautical miles off coast which in fact is also territorial waters. Fishing beyond territorial waters and in Exclusive Economic Zone (EEZ) is the responsibility of MFD. All the four provinces of Pakistan, namely Punjab, Sindh, KPK and Baluchistan have Departments of Fisheries and each Department has a Directorate under it to deal with the subject of fisheries. In this capacity, the role of Fisheries Department (FDS) is the implementation of work in the fishery sector, and the operation of fish harbors under their jurisdiction except Korangi fish harbor which is under the administrative control of MOPS. Inland fishing and fish farming is also under the control of FDS, controls the public inland water related fisheries through taking conservation measures as well as in this governing capacity the FDS run hatcheries, provide extension services, collect primary data and promote fisheries through producing literature and brochures and running seminars.

Fishing beyond territorial waters (which includes the deep sea activity) is however, a Federal responsibility. The federal Ministry of Food, Agriculture and Livestock is the principal ministry dealing with the fishery sector. At Federal level FDC Office of MOPS primarily deals with policy making regarding fish catching, exporting, and fisheries in EEZ and deep sea fishing and the future development of the sector. It also obtains loans from foreign sources such as the Asian Development Bank and foreign governments. The Ministry is also responsible for the collation of data collected by the provinces at the national level. It also controls the issuance of licenses to fish processing units for exporting processed fish, and to vessel operators for operating ships in deep-sea waters. It also plays a role in the operation of projects such as Korangi Fish Harbor. The federal Ministry of Communications controls and operates Gwader Fish Harbor, Baluchistan as well while the Pasni fish harbor in Baluchistan is not a federal subject and in fact under provincial control. It is evident that there is a complexity in managing the waters for exploitation of its fishery resources which has given rise to many overlaps in functions causing constraints in the development process of the sector. There are conflicts in the regulatory measures being adopted by two provinces sharing the same sea. Though with the passage of 18th Amendment a number of issues have been resolved between province and federation but some remain viz ownership of the Karachi Based Korangi Fish Harbor and the dual role of the competent authority both as development agency and the parallel side Control authority for issuing SPS

related certificate for fish export. The Karachi Fish Harbor, which is estimated to handle 90 percent of all fish and even 95 percent of exported fish, is under the SFD jurisdiction but the MFD has the control on the management of its auction halls situated on Karachi Fish harbor.

4.4 Key Institutional Stakeholders

Fisheries sector has many stakeholders including several agencies functional at federal or provincial level as well as some working as autonomous /semiautonomous bodies. The survey of these agencies showed that most of these have a management system for regulating fish production and or trade including export trade in accordance with the approved standards of hygiene. The Marine Fisheries Department has been declared the CA by the EU for regulating fish exports to EU. Yet, MFD, despite having the legal mandate, possess an inspection system which is well below the standards required to satisfy the demands of international market. All other agencies studied also have a poor stake in inspection so across the board, all institutions/agencies need additional staff and support for the capacity building of their staff and inspection and subsequent management system.

4.4.1 Stakeholder Analysis

1. **Marine Fisheries Department (MFD)** is the executive fishery agency of the federal Government, with primary responsibilities for ensuring management and development of fishery resources in marine waters beyond territorial limit. It is the declared CA for EU countries and thus the regulatory body for inspection/and certification of all fishery export products and also regulates fish processing plants.
2. **Korangi Fish Harbor Authority (KOFHA)** An autonomous body under the umbrella of Ministry of Ports and Shipping. KoFHA manages Korangi Fish Harbor and its allied facilities and regulates the value added processing plants operating at the harbor.
3. **Karachi Fish Harbor Authority (KFHA**) An autonomous body under the Provincial Ministry of Sindh Livestock and Fisheries which is responsible to manage and operate Karachi Fish Harbor and its allied facilities. It handles registration of boats and maintenance of the auction hall and harbor as a whole.
4. **Sindh Fisheries Department (SFD)** has been established for the development of fisheries and aquaculture in Sindh and controls fisheries in territorial limits, within Sindh. It has indirect control on Karachi Fish Harbor and is responsible for its development and support to boats for up gradation, and assistance to fish processors/operation on hygienic lines. One acute problem which the fish processors and for that matter all those who are interested in sustainable fish/shrimp production, are facing is consistently depleting fish, particularly, shrimp stocks. This is the one of the main functions of SFD that is, how to manage the illegal mesh size gears used in fishing in the coastal areas along with strict compliance of close season.

As this report pertains to the Sindh Fisheries it will not be out of place to mention that the Sindh Fisheries Department was established in 1969-70 The Director general Fisheries office is in Karachi and various functional arms of the department are:

- Directorate General Fisheries Sindh.
- Directorate of Fisheries Sindh (Inland).
- Directorate of Fisheries Sindh (Research & Development)
- Directorate of Fisheries Sindh (Marine)
- Directorate of Fisheries Sindh (Hatcheries & Trainings)

- Karachi Fish Harbor Authority, a semi-autonomous body under Sindh Fisheries Department.

Strengthening of the department actually occurred due to: First Aqua-culture Development Project (1980-85) and Second Aqua-culture Development Project (1989-94) which were supported by the Asian Development Bank.

5. **Fishermen Cooperative Society (FCS)** is a welfare body of fishermen which once used to fully manage the auction halls of Karachi Fish Harbor and now controls the marketing of fish and shrimp in Auction halls through managing mole holders. It is the responsible agency for maintenance and operation of auction halls in accordance with approved EU quality standards. FCS is also running projects for social welfare of its member community.
6. **Fisheries Development Board (FDB)** Government established, private sector-led, a not for profit Company registered under section 42 of Company's Act. The FDB is chartered for promoting private and public partnership, initiating national programs for the sector with an objective of promoting private sector investment in fisheries and aquaculture sector. Currently it is running the PSDP funded aquaculture and shrimp farming project. Policy research and innovation programs directed towards fisheries production sustainability falls in its mandate as well.
7. **Federal Ministry of Ports and Shipping**; is the policy making body for development of fisheries at the federal level. It is the controlling Ministry of MFD and KoFHA and its own working arm is the office of FDC The role becomes extremely important for the development fisheries sector.

4.4.2 A Note on Role of Fishermen Cooperative Society – the Issues

The role of this body has evolved slowly, starting as a welfare body for fishermen, and slowly took over the whole management of Karachi Fish harbor, particularly its auction halls and its total functions. Subsequently, KFHA slowly took over and FCS's role became limited to marketing of fish in auction hall and they no longer manage the auction halls. FCS however remains an important and powerful body with a vast membership and retains, officially or unofficially multiple stakes in fish exports. They were provided technical assistance in the past under several programs. Their role in quality control is evident and they have plans to improve upon compliance related issues. They have indicated that training slots for specific employees in inspection and maintenance of hygienic conditions at fish-handling places could improve their efficiency. They definitely do require capacity building aimed at acquiring knowledge in maintaining a cool chain, and its international standards thereof.

4.4.3 A note on Role of Karachi Fish Harbor Authority of SFD (Auction Hall management etc. and in the context of "unauthorized" landing jetties)

KFHA manages the auction halls at Karachi Fish Harbor (KFH) which virtually is used as the only EU-approved gateway for all the fish exports. Other unauthorized landing stations /jetties are working at other spots along both Baluchistan and Sindh Coast but all the catches make their way to the auction halls of KFH which are therefore crowded and lack capacity for handling the bulk of fish as a per quality standards .

One alternative to the problem is to immediately bring KoFHA under operation, so that the boats can off load their catches at the KoFHA auction hall. But the auction halls of KoFHA need revamping and upgrading in accordance with the acceptable international standards. And there is need for development of rational management plan to make use of this harbor. The burden on KFH can also be released by developing modern small jetties at several active/feasible landing

sites along Sindh and Baluchistan coast. Both SFD and BFD are working on this option. Intensive support is needed to facilitate these agencies in fulfillment of their tasks to help ease the situation on the KFH and thereby add towards achieving potential gains through enhanced competitive export.

4.4.4 A note on role of The Trade Development Authority (TDAP) of Pakistan

The Trade Development Authority (TDAP) of Pakistan organizes participation of Pakistani Fish traders in international exhibitions on cost-sharing basis permitting the exporters to meet their counterparts and for showcasing their products enabling them to establish linkages with foreign buyers. One drawback is that generally TDAP does not receive any information regarding follow-ups and feedbacks that could have left with the recommendations for issues such as designing of a branding and marketing strategy along the line of other export sectors. Seemingly there is no targeted market research or campaign, Pakistani fisheries products have zero to low value addition presently fish, as raw commodity/ goods, are exported with certificate of origin up to ME, Thailand etc. where they are processed, packaged and branded. It is estimated that with the addition of branding, products can earn up to threefold higher than the current returns to the industry/individual processors. The canned fish sector which is now getting, defunct could also be revived. Until 2007 Pakistan's primary market was the EU, but following the imposition of the ban, the marketers diverted their products identifying new markets without thinking to change their practices. Consequently, there is a shift in our exporter's attitude, as is obvious form looking into the new horizons which our exporters have found or their fish exports; accordingly our new and replacements markets are in Middle and Far East. According to information provided Pakistan's main fisheries export markets increasingly are China, Vietnam, Saudi Arabia, Indonesia, and Malaysia**.**

It is noteworthy however that when TDAP was EPB (Export Promotion Bureau of Pakistan) it generously provided funds for revamping and development of Auction Hall (K-1) of Karachi Fish Harbor which today is the only EU approved auction hall in the country for fish export to EU countries. .

4.5 Institutional Constraints and Discrepancies in Fisheries Data Collection system

The Sindh DOF has a training institute at Thatta. The various departments provide training to the participants both from within Pakistan and from neighboring Afghanistan. The PARC has established the Aquaculture and Fisheries Research Institute (AFRI) in Islamabad with a unit of research functional in Southern Zone Research Institute of PARC located within Karachi University which conducts production technology-oriented research in aquaculture and reservoir fisheries.

Several universities such as Sindh University at Jamshoro and Karachi University, Bahuddin Zakariya University at Multan, the Agriculture University at Faisalabad and University of Animals and Veterinary Sciences Lahore are engaged in academic aquaculture research. Pakistan however has no scientific baseline/ national database quantifying fish stocks and species and monitoring to enable supply chain management or conservation. Data available is third party agency data or ad hoc data and there is centralized body or legislation addressing the same. The same applies to Fisheries institutions in Sindh who lack expertise for collection and analysis thereof of crucial fisheries data that could provide a base for policy making.

4.6 Major Marine Fish Species, Biomass and Their Fishery

Various governments, FAO and other UN agencies, MFD have undertaken independent studies to determine the size of the fishery resources in Pakistan, but have all arrived at different estimates. The estimates of biomass, maximum sustainable yield, landing and incremental

potential (i.e. the additional output that could be achieved) for different species of fish derived by the Marine Fisheries Department are given in table below showing that the shrimp,cephalopods, mollusks, crabs and lobsters do not have much incremental potential after the landings were deducted from MSY. Therefore, the only additional benefit to be derived from these species is to have value added processing. Considerable incremental potential exists in small pelagic species such as sardines and anchovies, and in large pelagic species such as tuna and mackerel. These species can be used for canning and other forms of processing of sardines, anchovies and tuna. Tuna and mackerel can also be processed raw (sashimi) and loin (frozen). The largest incremental potential (about 5 million tons) is for mesopelagic lantern fish. These fish are 2.5-5 cm long, and are found between 300-1 000 meters depth during the day, and between 50-500 meters during the night. These, however, are only good for making fish meal, preferably on board.

Table 2. Fish Resources And Additional Sustainable Catch Potential (Tons)

Resources	Biomass	M.S.Y.	Potential
Small pelagic species	700 000	300 000	200 000
Large pelagic species	80 000	60 000	26 000
Demersal species	500 000	300 000	74 300
Shrimp	88 000	35 000	-
Cephalopods	20 000	12 000	6 000
Mollusks	8 000	4 000	3 500
Crabs	10 000	6 000	2 800
Lobster	1 300	6 000	-
Mesopelagic	10 000 000	5 000 000	5 000 000
Total	11 407 300	5 717 600	5 312 300

4.7 Fleet Size and Characteristics of Fishing Operations

Most of the fishing boats being used in Pakistan are made of wood. There are about 19 000 registered boats in Pakistan, of which about 14 000 boats are being operated from Sindh, and the remaining 5 000 fishing boats being operated from Baluchistan. In the Exclusive Economic Zone of Pakistan, 30 fishing vessels (20 stern trawlers and 10 tuna long liners) are permitted by the government to operate beyond 35 miles from the coastline. Fishing activities are continued throughout the year; however, peak fishing seasons are during post-southwest monsoon calm period (September to November). Shrimp are caught throughout the year except June and July, during which time the Government of Sindh imposes a closed season.

The most common fishing gear used in Pakistan is the gillnet, used by both small as well as larger fishing vessels. Smaller fishing boats employ gillnets in shallow waters, and catch a variety of Demersal fishes such as croakers, pamphlets, trevallies, mullets, catfishes and sharks. Bottom set gillnets, locally known as tukri, are also used for catching shrimp. In contrast, trawling for shrimp is the most important fishing gear being used in Pakistan, and is undertaken by medium sized fishing trawlers (LOA 15 to 20 m). Large gillnetters are employed for catching tuna, mackerel, sailfish and other pelagic species in offshore waters. Sardines and anchovies are caught in shallow coastal waters using encircling nets locally known as katra. Line gears are also used in shallow coastal waters for catching sea breams, croakers, eels and other Demersal species.

Fishing is undertaken right from the seashore to 200 nautical miles out to sea. This distance has been divided into two broad categories known as (i) coastal water fishing (up to 12 nautical miles) and (ii) deep sea fishing. The area of deep sea fishing has further been divided into Zone-I (12 to 35 nautical miles) and Zone-II (35 to 200 nautical miles). Coastal water fishing is undertaken in most coast villages. These villages are predominantly inhabited by fisher folk whose main livelihood is fishing. In contrast, deep-sea fishing in Zone II is undertaken largely as a commercial venture. The zone is reserved for foreign as well as Pakistan Flag vessels. Several restrictions are imposed on the fleet operating in this zone, including:

4.8 Environment and Sustainable Fishing

One of the key issues raised in various policies has been environmental degradation as a cause of depleting stocks including deforestation of mangroves, loss of ecosystems.

Geographically, Pakistan's coastline displays varying climatic and physical characteristics and is influenced by the extreme most reaches of the 'Indian Monsoon' weather and the 'Mediterranean weather'. The coast of Sindh is sub-divided further into the Indus Delta / Creek system and the Karachi (capital city of Sindh province) Mega City coast. The coast of Baluchistan is similarly subdivided into the Lasbela and the Gwadar coasts.

The Sindh coastal region, stretching over 220 km, is located in the south- eastern part of the country between the Indian borderline along Sir Creek on the east to Hub River along the Baluchistan coast on the west. Approximately 300,000 sq. km of the Indus water-shed, of which 50 percent is located outside Pakistan (India, China & Afghanistan), is drained by the Indus River. The Indus Delta (approx. 1000 sq. miles) is the most prominent ecological feature of the Sindh coast (covering 85 percent of the coastal belt in Sindh), the coastal morphology of which is characterized by a network of tidal creeks formed as a result of changes in river beds and a large number of small and large islands with scattered mangrove vegetation.

The Indus Delta is reported to have the largest arid climate mangroves in the world. The Karachi coast constitutes a coastal belt of about 100 km length situated between the Indus Delta on the south-east and the Hub River on the west. Most of the coast, with the exception of scattered patches of mangroves, is devoid of any other kind of vegetation. The Baluchistan coast extends from the mouth of the Hub River in the east to the middle of Gwader Bay (bordering Iran) in the west and stretches over a distance of about 770 km.

In general the long coast of Pakistan (1,000 km) is very favorably located to command large and varied Marine fisheries resources characterized by an important up welling center in the west, reversible wind system and long fishing season. Unlike the Pacific and the Atlantic Oceans it is free of hurricanes and is twice more productive than the other portion of the Indian Ocean. On an over-all basis, the Arabian Sea fisheries resources can produce over 20 million tons of fish and shellfish. But these are still under exploited. Thus the sea and the ocean offered very rich and dependable resources to ensure supply of 15-20 kg fish per person per year, as capable of producing over 3-4 million tons table fish against the present production of 0.25 million tons fish a year against the domestic supply of one kg per person per year in Pakistan and ensure supply of balanced diet of animal protein food to the common man. The fish industry could not be developed on modern lines so far as we see that the Industrial frame-work is small and yet striving to strategically initiate and execute major development program on the line of the East Asian or the European countries. The government .needs support from a team of specialists trained in any important trade of the fish industry if at all a much needed supportive secondary fish industry is to be established in the province such the manufacture of synthetic fiber floats, ropes and nets, machinery other equipment's etc. Yet another area where the provincial public sector could not assist the private sector is the exploitation of rich resources existing for culture of fish shrimps, crabs, and lobsters at suitable points.

The wildlife along the Pakistan coast consists of both marine and terrestrial species ranging from turtles to flamencos. Mangroves are breeding grounds and hatcheries for to (NAME SPECIES) mud crabs before they go out to sea. Although no formal economic valuation studies have been carried out by the Government or FAO, figures used cite that there are about 200 species of fish present in the mangroves (IUCN). However, there is no reported on the exact contribution of stocks from mangroves towards overall fish production. This exercise is presently under discussion with the Sindh Forestry Department as an intervention.

The apex Act covering environmental protection in Pakistan was till 1997 the Pakistan Environmental Protection Act 1997, and post 18th Amendment, each province has developed its own law. The Sindh Environmental Protection Act and is enforced by the Sindh Environmental Protection Agency. Additionally, criminal codes and the Sindh Fisheries Ordinance, the Forest Act 1927 and the Sindh Wildlife Protection Ordinance 1972 also provide for protective and punitive measures.

With regard to industrial pollution affecting waters and mangroves, the Sindh Wildlife Department affirmed that toxicity of waters in Sukker and Dadu resulted in loss of biodiversity and wildlife. Toxicity in these waters has resulted in any case in the mutation of the blind Indus Dolphin. The specific provisions and mandate for sampling testing and taking action remains with the Sindh Environmental Protection Agency.

The feedback from the Wildlife authorities also identified issues arising from use of poisons by the communities to kill fish inland in lieu of use of nets leading to (i) destruction of all ecosystem flora and fauna. They highlighted a no other issue i.e. toxins in the fish which is then sold in the markets along with toxins in the food chain meal and consumption.

With regard to discharge of industrial waste in the sea, presently there is no operational treatment plant available for Karachi and wastewater is not treated prior to being discharged. There are conflicting reports on the total industrial waste produce in Karachi and how much of it dumped in sea damaging fisheries therein.

However in the absence of testing and monitoring by the mandated authority i.e. SEPA, quantification of damage cannot be made nor calculations on the loss to fish species on account of industrial pollution vis a vis overfishing, nor can any impact on human health on account of consumption of these stocks be assessed.

Interviews with the fishing community in the Keamari harbor region in proximity of the Tasman Spirit spill revealed the following. Due to poverty and social constraints the local communities continued to consume the fish stocks and reported no side effects. In the absence of testing and medical analyses the effects of industrial pollution on fish stocks and human health cannot be assessed.

Regarding the loss of mangroves, total mangrove cover in Pakistan has declined over the past 60 years due to various anthropogenic reasons such as cut off of water to the Indus Delta. Other reasons remain deforestation through human interventions including local communities. At the present time the mangrove forest cover in Sindh used to comprises 8 species of mangroves and is now home to only 3 (*Rhizophora,Ceriops, Avicennia spp).* In Sindh the Indus Delta mangroves are spread over a surface area of 600,000 Ha extending from Korangi Creek in Karachi to Sir Creek in the east. The administration lies with the Sindh Forestry's department and under Notification No F &W (SO II) 5(18) 2008, declared and notified 260, 000 Ha in Thatta and 1931 Ha in Karachi have been notified as Protected Areas and benefit from the provisions described under Section 4 of the Sindh Forest Act 1927. (This area is mapped through GIS with SUPARCO and is expected to be expanded further).

However, it is important to note that unless a patch of mangroves is declared and notified, it does not automatically benefit from PA status. Secondly under existing laws, while forestry officials have jurisdiction over the use of the forest cover, they do not exercise any powers over illegal or out of season fishing activities.

Mitigation measures for loss of mangrove cover can be used along the lines of IUCN's community plantation and incentive schemes in Thatta and Badin (Sindh Coastal Community Development Project) which achieved a survival rate of average 70 percent and up to 90 percent. The success of the project depended in large part by on-boarding stakeholders such as Community Organizations and Women's Community Organizations and providing monetary incentives.

The formation of the Sindh Environmental Protection which combines all government department stakeholders and industry representatives would be a good forum to discuss review and harmonization of laws that would enable both protective measures for conservation and sustainable fishing at industry and community level. A new wildlife act is also being passed which will cover marine areas and protected areas.

4.8.1 Critical Areas of Concern of Marine Coastal Fisheries Resources in Sindh

- Consistently declining stocks
- Unchecked over fishing
- Use of Illegal / Un-friendly Nets
- Increasing Fleet Size (open access Fisheries)
- Mechanization of Boats meaning better harvesting opportunities
- Habitat Destruction Mangrove Denudation
- Unabated Pollution

4.9 Significance of Marine Fisheries Resource Survey Being Conducted By FAO

A survey currently in progress currently in progress in 13 major creeks of Sindh has found the Fish population to be very low. So far, 147 species of marine fauna have been identified. The survey is being carried out in Issaro, Wadi Kuddi, Dabbo, Mal, Pittaini, Hajamro, Chaan, Richhal, Jang River, Chann, Wari, Khar and Kajhar creeks. The initiative is part of a Rs500 million(US$6.14 million) Fisheries Stock Assessment Survey Program undertaken by the marine fisheries department (MFD) with technical support from the Food and Agriculture Organization (FAO) under the Fisheries Resources Appraisal Project (FRAP). This is the first comprehensive survey of Pakistan's marine resources that include the creek areas. The biological survey of marine fisheries resources in the coastal creek areas would help assess the role and contribution of creek areas to the production of marine fisheries resources as well as to provide training and capacity building to national fisheries research and management institutions. Thirteen study areas within the creeks have been identified in consultation with the team of researchers, scientists and relevant staff member from the MFD, the fisheries departments of Sindh and Baluchistan, National Institute of Oceanography, Centre of Excellence in Marine Biology, Karachi University, Department of Geography (KU), Space and Upper Atmosphere and Research Commission and World Wide Fund for Nature-Pakistan. The objective of the survey also includes identifying threats to selected marine and creek species of fisheries interest in creek areas and potential management/mitigation measures. While MFD Coordinates this survey there is a role of Sindh Fisheries Department as one of the end users of the results

likewise other institutions like WWF are involved in these studies along with other organizations such as KU's department of geography on developing GIS model based on spatial data integration. The initial findings from the Sindh creeks indicate a population comprising of 147 species having fish, shrimps, crabs and prawns. According to preliminary findings the steep decline in fishery resources is mainly due to the open use of banned nets and pollution in the creeks which served as breeding grounds for different marine species.

5. Market and Marketing (The Demand Side)

(Marine Fish Markets and Marketing)

5.1 Profit Margins and Income Level of Fishing Crew

Fishermen operating on fishing boats (same day returning as well as long hauling day's boats)

The poorer segments of the coastal village population often rely on employment as wage laborers in fishing boats it was found that generally, the wage rate for fishing crew is fixed and the crew gets a well-decided percentage from the returns of the catch, which they have marketed. There is a fixed share for Captain (Nakhuda) , navigator and fishermen crew .However, the wage rates vary with the location and time of the year. The wage rates are calculated after deducting the operational cost of which incurred on that particular fishing trip> this cost generally goes to the boat owner/mole holder (as the case may be) The operational cost included fuel cost , ice cost , cost of food for crew members which in fact constitute the bulk of operational cost. The Boat owners generally bear the cost of any maintenance of boat starting from investing in the total cost of boat. The Crewmember can make up to Rupees 2000 per day depending on the catch quality and size. The Nakhuda and Navigator get about 50 percent of the sale price (minus Operational Cost) while the rest of the income is distributed among crewmembers equally. However, it ought to be mentioned that villagers reported that work is not available to the same extent every day. At places where the approachability is good, the fishermen can also get an alternate source of daily labor for wages. Sometimes the fishermen crew are also paid in kind. On the other hand, owners of fishing boats can earn substantial net incomes during a fishing season, which is generally 50 of the total net income received after fishing trip. . This can range from about 200000 to 300000 per day depending on the catch and market. All this means that traditionally, the income of laborers on fishing boats is determined through a sharing agreement. In general, after sale of the catch the boat owner gets about 50 percent and the rest is shared among the crew members in accordance to their The smaller sized engine boat provide much lower income to fishermen say in the tune of Rs 1000 to 1500/day and these are the boats which make a day- long trips.

5.2 Seasonality aspect in Fish catch and income/ profit distribution for fishermen thereof

The livelihoods of the poor stakeholders (like fishermen and all others involved directly or indirectly with fisheries business) of coastal communities are at a very high stake due to Seasonal nature of fishing in marine waters. During the major season of fishing which accrue during mid-July to mid-December November while the other season fall between Januarys to March, during these seasons as well there are lean and peak periods. During lean periods the catch is marginalized to as low as 50 percent and one can see the increasing catch per unit of effort being put in to sustain livelihood. Consequently, the obvious results are that the income levels of the stakeholders fall badly during lull periods. In the creeks and bay however the fishermen can catch fish almost all year round but again with overlapping high and low catching periods affecting their margins of income accordingly. In addition to the fishing season, seasonality also forms part of many other aspects of villagers' livelihoods, including demand for wage labor, access to credit, and occurrence of diseases. All of these add considerably to the cost of their living.

5.3 Average costs and margins

(cost/profit sharing and seasonality)
The fishermen's share in the consumer price is estimated to be about 40 percent. The total marketing margin, which is 60 percent is sub-divided into:

a) Assembling: 18 percent

b) Wholesale Marketing: 20 percent

c) Marketing: 20 percent.

5.4 Marine Fish Marketing Chain: Role and Commission in Mole System and by FCS

The Sea and Fresh-Water Food Mole-holders Association which emphasizes on evolving an effective mechanism to regulate the fish business at Karachi Fish Harbor as there is no there no organized, disciplined, or legalized fish trading system in Karachi Harbor at present .

Under the present mole based system, the fishermen catch the fish and unload it at Karachi Fish Harbor for sale. The Fishermen Cooperative Society has sole rights to conduct the sale of fish through auction or otherwise and charge 6.25 per cent commission on the gross sale amount. As the FCS is the main broker issues fish brokerage permission to the mole-holders, the members of the association. Thus, the mole-holder, is in fact a fish broker acting as agent on behalf of the FCS.

The role of the FCS is simple and straight forward that is whatever amount of fish is sold, they immediately claim their 3.125 per cent commission of the gross-sale proceeds. If not paid, the mole-holder faces cancellation of the agreement with the FCS.

The mole is also a financial institution working in proxy so as such the mole-holder's business is highly capital intensive and cumbersome and full of financial risks. The mole- holder has to advance money to the launch owner for having a fishing launch registered at his mole. Before sending a launch on fishing venture, he has to pay for buying fuel, ice for preserving fish, ration for feeding crew during the voyage However, on return from a fishing trip the boat owner is obliged to sell his stock to the mole holder who provided operational cost and overheads for their fishing trip.

5.5 Fish Marketing Chains and Systems in the overall Trade Context

5.5.1 Fisheries Products and Production

The marine catch consists of more than 30 species of shrimp, ten species of crab, five species of lobster, and 70 commercial species of fish including sardine, hilsa, shark, mackerel, butter fish, pamphlet, sole, tuna, sea bream, Jew fish, catfish and eel. 60000-70000 tons of shellfish are harvested every year from coastal waters of Pakistan and these include shrimp (White, Pink/ Brown ,Kiddi and Miscellaneous shrimps) lobsters and crabs and cephalopods (squids octopus and Cuttlefish etc.) are also important export species. In addition, these products have a demand in the domestic market as well. Fish, however remains to be the major commodity for export and with good preference for domestic consumers as well; fish and fishery products are exported mainly to China, Japan, European Union and Persian Gulf countries.

In terms of export marketing export it was found that that the fish are exported in salted, frozen , chilled and other forms; shrimps are exported in frozen form (both head on whole bodied as well as) and in peeled form : lobsters are exported frozen live; crabs are exported frozen, live

and canned; mollusks like oysters, button shells and abalone etc. are exported frozen and preserved: fish products such as fish meal., fish maws, and shark fins.

Export trading can earn huge amounts of foreign exchange. The fishing sector needs priority with good management to promote this trade. There are prospects that the government will work on new projects for instance construction of modern harbor for fishing at Karachi and establishing the cold storage and marketing facilities, which will help to promote fishing and export trade. UNIDO, under its TRTAII program, which is funded by EU, has recently prepared feasibility for revamping infrastructure facilities for landing fish at Korangi fish harbor along with developing a plan for developing Business Park at this site. This could further help in developing value added processing plants at this site where already four such fish processing plants have started their operations and room exists for establishment of 20 more processing plants. The Koreans are already in the process of building their processing plant for making Surimi from minced bream meat.

Other projects financed by EU and other donor agencies as well as provision of funds by the GOP to FDB for cohesive development of model shrimp farming in conjunction with FDS will not only increase the annual fish catch, but will also promote prawn farming which in turn would be instrumental in creating more employment and trading source in Pakistan.

5.6 Value Addition

Pakistan's fishing industry is a growing sector and in order to develop the industry further and obtain a larger share in the world market it has been identified that a strategy has to be put into place to 'add value' to product and process alike.

The figure below shows the fisheries sector value chain and which markets offer the highest return. Currently up to 90 percent of the fish and seafood products landed in Pakistan are achieving the lowest value return. This is mainly due to the resources and knowledge available to those at the primary level being limited.

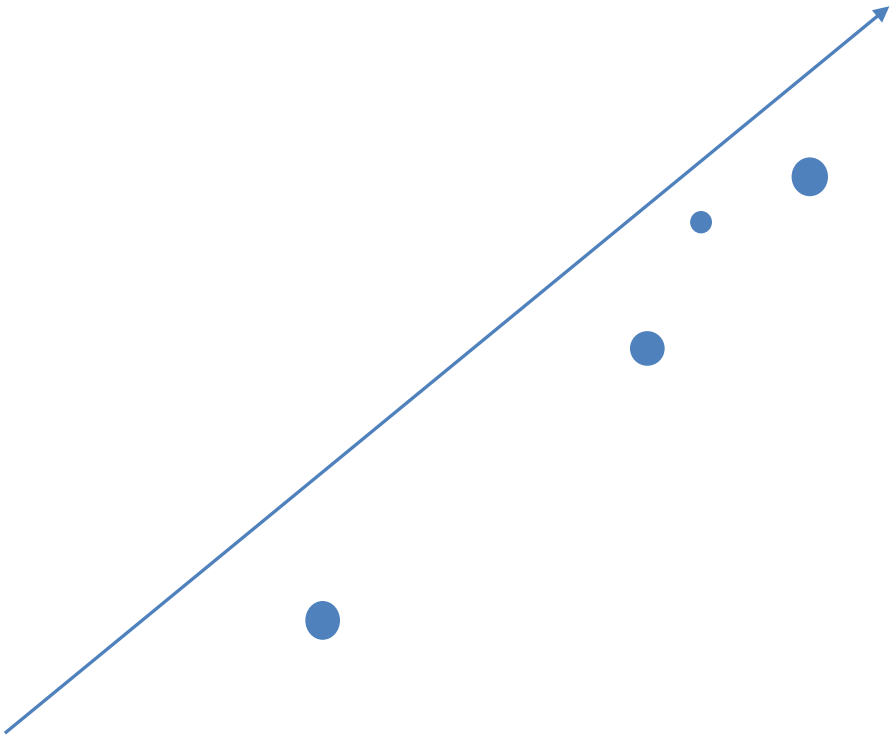


Figure 1 Adding Value to Marine Fisheries in Sindh and Baluchistan Pakistan

For instance to precisely develop the focus on achieving 'added value' to the Pakistan fishing industry a comprehensive strategy is needed based on ;

- Reviewing the specie, availability and volume of fish and seafood products and by-products available.
- Meet and discuss current processing methods with local companies to establish where value addition can be incorporated i.e. through different processing methods or market opportunities.
- Assess potential new markets including export markets for industry growth.

For a rational delineation of doable actions, a series of meetings, both formal and informal, were held with several government and other institutional as well as entrepreneurs from across the fishing industry in Korangi and Karachi areas and Director General of Fisheries Government of Baluchistan foe value addition in fisheries Further, a number of fish processing units were physically visited. All parties discussed what stage they were currently at, what processes they were currently using and why and how they perceive future opportunities which will add value to their products. In addition to the present mission and information obtained therein, one of the Study Consultants was involved working for UNIDO on SPS issues and value addition in Fisheries in Pakistan during which he analytically looked into their current practices of fish processing sector in Pakistan and gauged their potential. At the time of this study survey it was found that Review of landings, species, availability, fishery product quality, usage and production in Karachi, Sindh.

Table 1 Attempt to summarize some of the species and their current usage (Karachi and Korangi)

Landing Site Visited	Species	Usage
Korangi	Sardine	canned, minced
	Squid	bait processed
	blue crab	IQF
	top shell	Japanese market
Karachi	Bream	minced - formed
	Mackerel	frozen IQF

Table 2 Attempt To Summarize Some Of The Species And Their Current Usage(Baba Bhit)

Landing Site Visited	Species	Usage
Baba Bhit	Squid	bait processed
	ribbon fish	minced formed

Added value production processes have been identified as the most suitable options for the fish industry.

5.6.1 Main Quality Issues with Coastal Landing Limiting Value Adding Process are Identified as:

- Spending too long at sea
- Lack of ice facilities on board/ vessels
- Mesh size too small resulting in high by-catch, low value sales.
- Poor handling practices and limited knowledge of quality (SPS) and compliance as well as product value.

5.6.2 Shrimp Value Chain Analysis

A processed shrimp production is used in this study to draw inference to elucidate constraints to competitiveness in the Fisheries Sector.

A value chain analysis (VCA) from the processed shrimp product is used as an example to show that many identified improvements are too minor to reverse the fortunes of the industry, in the face of high overhead costs and declining fish stocks. The shrimp loses about 48 percent of its weight during processing (i.e., it takes 1.92 kg of raw shrimp to produce 1kg of processed shrimp; 30 percent of the weight loss comes from beheading with the remaining 18 percent from peeling) the yield of processed shrimp will be less than the amount of raw shrimp caught .An analysis by Shahid et al (2007) based on a typical 15 day fishing trip for a 45’ diesel powered fishing boat, shows that the catch can be divided into three main components: raw shrimp which accounts for 5 percent of the catch by weight and has the highest value; edible fish (10 percent) which fetch , on the average, about 75 percent of the shrimp price and; the trash fish (85 percent) which sells at almost 5 percent of the shrimp price .

This indicates that fisherman make most of their revenue from the non-shrimp component of the catch (even though it is a small amount of total catch). Part of the explanation for the relatively

low shrimp (and edible fish) catch rate in Pakistan may be the result of inefficient fishing techniques. The number of fishing boats has been increasing steadily – for example, in 1966 there were only about 400 fishing boats in the Karachi Fish Harbor, and now there are in excess of 13,000. While there is a ban on the catching of juvenile shrimp, locally referred to as PATAS, the estimates suggest that 50 MT/day are caught during August to September (the peak breeding season), and 5 MT/day are caught between October to July. A similar story emerges for the other forms of marine life. Dredging damages the sea bottom and hence the feeding grounds for juvenile fish. Extensive use of small gauge nets further depletes the fish stock. Finally, anecdotal evidence from local fisherman indicates that both the quantity and quality of shrimp and edible fish catch has been declining

5.6.3 Frozen Shrimp Production and Value Chain

About 98 percent of the shrimp is processed as frozen shrimp, therefore, like approach adopted in other VCA analyses, the price and weight of shrimp is measured in terms of the processed output, so as to account for the weight loss during processing. Thus, after adjusting the catch for the weight loss in processing .viz, 48 percent (i.e., it takes 1.92 kg of raw shrimp to produce 1 kg of processed shrimp) the yield of processed shrimp will be less than the amount of raw shrimp caught. The costs of catch and haul for shrimp are the total costs for the trip pro-rated by the share of shrimp in the gross catch, in this case 5 percent. Analysis of cost incurred can be further broken down as catching shrimp accounts for 90.7 percent of the cost of the raw materials (shrimp), and the three largest costs of catching the shrimps are diesel fuel (61.7 percent), repair and maintenance (19.3 percent), and ice (7.6 percent) It may be further noted that that the ice is mostly contaminated and of poor quality and hence about 5 percent of the shrimp catch is wasted before the boat reaches port. A further 10 percent is lost due to bad fish handling techniques, so resulting in 15 percent of the shrimp catch being lost at sea. Shahid et al (2007) estimated revenue from trip of a 52’ vessel hauling trip costing Rs 388881 and the total profit out of this trip was around Rs 95,047 of which the contribution of shrimp was only Rs 24185. The largest portion of earning came from showing that even the trip was targeted for shrimp catch the maximum profit comes from fish. The share of trash has a n element of consideration, and that is that a portion of it can be recovered for human consumption.

Table 3 Estimated Revenue per Shrimping Trip

	(Raw shrimp)	**Edible**	**Trash**	**Totals**
% of catch by weight	5.0%	10.0%	85.0%	100%
Gross weight in kg	271	542	4, 607	5,420
Price (Rs per kg)	137.3	100	6	-
Gross value (Rs)	37,208	54,200	27,642	119,050
Wastage rate	35%	20%	0%	
Net (of waste)	24,185	43,220	27,642	
Net Income Value (Rs				95,047

Note: The above represents raw shrimp. There is a weight loss of about 48% when shrimp are processed. Parameters and values in bold are based on field interviews and used in the study. All other entries are estimates and can be varied for sensitivity analysis.

Exports of shrimp must also meet international Sanitary and Phytosanitary standards (SPS). EU inspectors raised concerns about hygiene in both the fish holds of some boats and the auction hall. The Pakistan Government, instead of facing an externally-imposed ban decided on a voluntary ban on exports. Observers comment that just prohibiting betel chewing (which causes chewers to spit on the floor where fish are kept) and smoking (where cigarette butts are left on the floor) would significantly reduce the problem.

A. Value Chain*

Icing at Boat (Loss= 5.0%) ====➔ fish handling at Boat (Loss due to Bad handling= 10.0%) ====➔ Weigh &Wash before auction hall transportation (Loss =1.2%)==➔ Transfer to Auction Hall (Loss =1.7%) ==➔ Auction (Loss= 5.8%) ==➔ Transfer to Factory (Loss= 1.7%) ==➔ De-heading & Peeling (Loss= 19.6%)=➔Grading & Sorting (Loss=1.7%) ===➔ Freezing (Loss =1.5%)

*Net Raw Material available for export /every 100% catch = 52.0% of the total live weight caught

B. Catch & Haul Cost

Labor (5.7%) ==➔ Food (5.3%) ==➔ Ice (7.6%) ==➔ Fees (0.4%) ==➔ Fuel (61.7%) ==➔ Repair & Maintenance (19.3%)

C. Processing Cost

Transportation➔ Peeling ==➔ Grading ➔ Packing (2.5%) ==➔ Storage (0.6%) ➔ Overhead (1.0%)

Figure 2 Value Chain for Frozen Shrimp Production and Processing

Bad fish handling comprises such factors such as shrimp lying off the ice, shrimp being crushed by the weight of other fish on top of it, etc.

5.6.4 Vessel to factory and subsequent processing

When the boat reaches Karachi Fish Harbor, the captain contacts the owner and a commission agent ("mole holder") to arrange for auction space and acquire necessary labor and the trolleys required to offload the catch. The catch is offloaded and weighed before entering auction hall. Prior to the auction, the mole holder, using local workers, sorts and reweighs the catch which may take hours in sun. This, combined with poor handling and hygiene in the auction hall, results in a loss of 8 percent of the original catch. The use of contaminated ice results in an additional 10 percent loss (of original catch) at the auction hall. The cumulative effect of all these losses is that 35 percent of the shrimp caught are rendered unsuitable for further processing. A further 2 percent loss occurs during this process. Thus, for example, of a total raw shrimp catch of 271 kg, only 176 kg are useable and this yields a total of 91.6 kg of frozen, headless peeled shrimp.

5.6.5 The Competitiveness

The wastages and actual recoveries during various stages in the value chain of frozen shrimp production and the resulting factory gate price of processed shrimp indicates that the high Pakistani cost is principally attributable to high cost of catching shrimp (raw materials). This combined with an absence of a comprehensive current survey of fish stocks results at this point in time makes it difficult to provide a definitive answer to the question of the international competitiveness and further evolution of shrimp fishing in Pakistan.

5.6.6 Comparative Export Competitiveness of the Shrimp and Fish Sub Sectors

The concept of competitiveness has been widely accepted therefore the ability to compete in the world market is a major concern. Pakistan needs to improve the governance as well as technological progress to increase high-tech exports. Technology-based activities help in improving export performance for enhanced competitiveness of a country. There is a dire need to suggest a model to government of Pakistan which describes that high technology, value added fish and fishery product exports using human capital as an investment in the country. Value Chain Analysis (VCA) will however require extensive research and development

It is being identified that Pakistan faces challenges in two areas for competitiveness.

I. Value losses in the cool chain of the existing marine catch, both for export/domestic consumption.

II. Fisheries management related shortcomings resulting in poor resource utilization/overfishing of resources.

The fish processors are of the view that they need guidance and capacity building for adopting compliance measures on SPS issues. Most of them however are aware of hygiene levels required at their processing plants such as implementation of HACCP. But due to cost factors, they are sometimes reluctant to export their products to the countries where Rules for fish imports are not so stringent.

5.6.7 Compliance with International Standards.

Studies show that standards provide a regulatory framework to the food (including fish) industry. Standards directly affect human health. However, the majority of producers in Pakistan (and Sindh is no exception) are yet to follow standards in food production . Generally, there is a lack of initiative to embrace global standards and this attitude has had some adverse impact on the performance of Pakistan (basically Sindh) Fisheries in global markets especially in lucrative European fish markets. Pakistan's fisheries like many developing countries also lack the infrastructure to implement compliance related parameters.

BOX 2

MFD acts as the EU designated Competent Authority (CA) in Pakistan. Private sector and Sindh Fisheries Department also enjoyed share from this program, particularly the fish processing industry. The UNIDO's support, under TRTA and subsequently TRTAII, to fisheries program of Pakistan included:

- A comprehensive Inspection Manual in accordance with international practice for purposes and use of MFD as CA and upgrading and accreditation of their microbiology and chemical testing laboratories by providing technical advisory services and provision of equipment, training and participation in PT schemes.
- Training in Standard Operating Procedures (SOPs), Good Manufacturing Practices (GMP), Good Hygienic Practices (GHP) and Hazard Analysis Critical Control Points (HACCP) and Traceability methods to staff of MFD, KFHA, FCS and fish processing plants
- Training of fishermen, boat owners, mole holders and auction hall operators in SOPs (Urdu) and good operational management practices along the entire fisheries chain.
- Technical advice for improvement of fishing boats and landing sites as well as technical advice and designs for up-gradation of auction halls, K-1 and K-2, operating under Karachi Fisheries Harbor Authority (KFHA)/ Fishermen's Cooperative Society (FCS).
- Expert guidance in application of SOPs and Traceability methods along the fisheries supply chain to ensure good hygiene practices in handling of fisheries products and traceability from fishing at sea to processing for export as well as expert guidance in development of HACCP Plans for fish processing plants and application of HACCP practices by processors. Studies on value chain analysis and SPS mapping in the fisheries sector were also undertaken.
- Provision of hand-held PC compatible traceability instruments to fish processing plants to cord traceability of fisheries products processed for export. After successful completion of TRTA program, the UNIDO has embarked upon TRTA II program aiming at a more focused approach towards addressing stakeholders need based interventions which are envisaged to have a long lasting impact on building capacity to further realize the export potential in various sector particularly fisheries sector of Pakistan .

5.7 Fish Meal Market Chain

Trash fishery constitutes a huge bulk of fish caught from the marine resources. In fact, in recent years, the catching of trash fish has become very much a targeted fishery operation and lot

many boats are now involved solely in catching trash fish which is very damaging to the fish population in the longer run even to being be fatal for the industry. This fishery is related to the large and Sindh Fisheries Department fishmeal industry with-in Pakistan, which consumes approximately 60 percent of the total catches. This fishmeal industry has three sources:

1. Species of low value and small size for which meal reduction is a reasonable use, and which are caught mainly by the pelagic fishery.

2. Spoilage of otherwise marketable catches due to poor handling, excessive trip length etc. If product handling would improve, these items might be interesting for higher value exports.

3. Undersized and immature individuals of potentially valuable species caught in shrimp trawls. It is telling that locally these are referred to as 'trash' and the fishery is known as 'trash fishery', with a shrimp by-catch. It is clear that the second and third source make the sustainability of Pakistani fisheries very doubtful.

It is clear that the second and third sources make the sustainability of Pakistani fisheries very doubtful. Most of the fish meal produced in the country is consumed by the poultry industry of Pakistan for developing its poultry feed. Recently, with the introduction of fish feed in the aquaculture production system the fish meal industry sees yet another buyer for their product as fish meal is going to be almost important constituent of the fish feed.

Fish Meal plants are now exporting as well their products, especially to China after the fish meal companies gets the certificate of approval for exports from Marine Fisheries Department. The Stake of Sindh Government is there, especially as a regulatory authority. .

5.8 Governing Market Regulations

West Pakistan fisheries ordinances and supporting legislation and regulation promulgated by the provincial DOFs provide rules and regulations for the marketing, handling, transportation, processing and storage of fish and shrimp for commercial purposes and the sale of fish used for domestic and inter-provincial trade. Contravention of this ordinance is punishable by imprisonment of up to six months or fines of up 10,000 rupees or both. A provision has also been made for a total ban on the use of destructive fishing gears as well as a closed season for the catching of shrimp during June and July.

However, the emphasis of the government has been on the qualitative aspects of fishing development.

5.9 Overall Regulatory Framework for various sub sectors of Marine Fisheries Impacting Governance

Until 2011, Pakistan's constitution delegated the overall management of marine fisheries to the Marine Fisheries Department under the Ministry of Food, Agriculture and Livestock (MINFAL). It was based on the Exclusive Fishing Zone (Regulation of Fishing) Act, 1975, which was amended 1993, regulating the management of fishing in the Pakistan’s EEZ in accordance with the UN Convention of the Law of the Sea[1]. It provides for:

• Licensing and management of fishing operation in the EEZ of Pakistan

• Fishing craft subject to navigational regulation

[1]Other legal provisions include: (i) The Karachi Fisheries Harbor Authority Ordinance No.11, 1984, which provides the legal basis to carry out efficient operation of harbor facilities and for periodic inspection of hygienic conditions of processing plants, ice plants, cold storage and other related activities, and (ii) The Coastal Development Authority Act (Sindh, Act No. XXVIII, 1994) provides the legal basis for planning, development, operation, management and maintenance of coastal areas, including development of fisheries, livestock, horticulture and agriculture.

• Prohibition of illegal fishing, including fishing with dynamite and poison

• Closed seasons and prohibited areas

• Penalties for contravention, including seizure and disposal of fishing craft, gear and fish catch[2].

In 2011, with the 18th Amendment, responsibilities for marine and inland capture fisheries were devolved to the coastal provinces Sindh and Baluchistan, together with MINFAL and other line ministries.

5.9.1 Deep Sea Fisheries Management (For Reference Purpose)

The Marine Fisheries Department (MFD) based in Karachi is mandated with the implementation of deep sea fishing policy. It is the oldest federal sector department (established in 1951) and works under Ministry of Port and Shipping. Its primary responsibility is management of fisheries in the EEZ beyond the 12 miles territorial waters. It is also responsible for fish stock assessment, inspection and quality control of seafood being exported from Pakistan, compilation of national fisheries statistics, and fishery related oceanographic, biological and technological research. The Department is responsible for implementation of Exclusive Fish Zone (Regulation of Fishing) Act (1975) and Pakistan Fish Inspection and Quality Control Act (1997).

Since the middle of the last decade, however, little if any deep sea fishing (beyond the continental shelf) is recorded, attributed by observers and resource persons to scarcity of stocks because of overfishing and “fishing down the food chain”, and steep increases in operational costs because of rising fuel prices.

5.9.2 Fisheries Management in Territorial Waters

The provincial governments of Sindh and Baluchistan were mandated with the responsibility for marine fisheries management within the limits of territorial waters, i.e. 12 nautical miles (n.m.) from the baseline (shoreline) by the Pakistani Constitution before its 18th Amendment[3]. Most costal fishing grounds in Pakistan lie within these limits, although in Sindh province the continental shelf extends to up to 80 n.m. from the shore.

[2] Adapted from FAO, Pakistan Fisheries and Aquaculture Profile, FID/CP/PAK, Rome 2009

[3] The Federal Legislative List listed functions pertaining to fisheries to be executed by Federal Government: export (No. 27), fishing and fisheries beyond territorial waters (No. 37), and federal surveys (No. 35). Functions performed by the federal government falls within these subjects or are covered under Rules of Business.

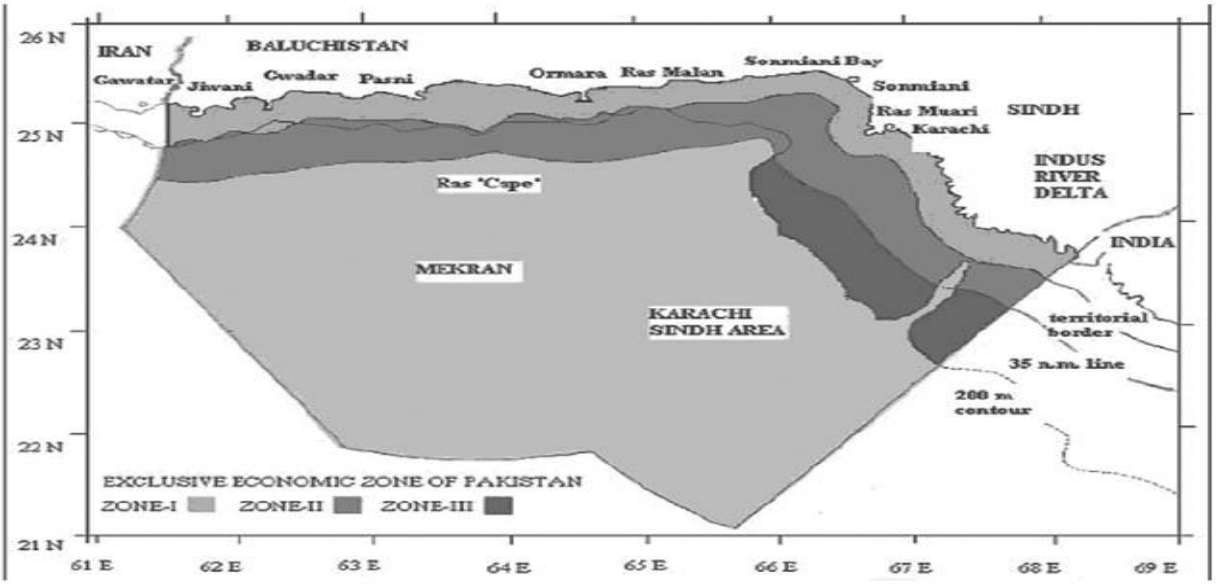


Figure 3 The Zoning of the Pakistani EEZ

In Sindh province, the Sindh Fisheries Department of the Department of Fisheries and Livestock is mandated with fisheries management, both in inland and marine waters. The legal framework governing the sector is based on the Sindh Fisheries Ordinance of 1980 and amendments thereof (last 2003). The respective regulatory framework was gazette in 1983. It includes provisions for licensing of fishing vessels in territorial waters of the province and regulations for marketing and processing of fish and shrimp etc. Management tools include prohibition of illegal and destructive gear, mesh size regulations, closed areas, and a closed season, with the tater promulgated as law[4]. Various amendments have been made including licensing of inland water fisheries in 2005.

5.9.3 Coastal Development

Unlike Baluchistan province, the coastal development authority in Sindh has jurisdiction only over Thatta and Badin with mandate to develop the coastal areas in these districts; improve the quality of life of the coastal populations by provision of infrastructure, employment opportunities and access to market of their products.

CDA has undertaken a number of interventions including SUPARCO SRS mapping of Aquaculture sites, development baseline survey of the areas (covering livelihoods gender etc.), Coastal Management Plans and study on Aquaculture (Euroconsult and Info fish) constructed 30 pilot shrimp crab ponds and rehabilitation of Badin Fish Hatcheries. Pilot oyster projects in the area failed because of lack of know-how. Upcoming projects for improvement include floating jetties in Keti Bundar with flaking factories and solar –powered cold storage.

Infrastructure and roads remain an issue and goods transported from the jetties can still spoil.

[4]Exclusive Fishery Zone (Regulation of Fishing) Act 1975, S.R.O. 329(1): The period commencing first June and ending July is to be the period during which and the entire area of the zone within which catching of shrimps shall be prohibited.

5.9.4 Fisheries Policy Perspective

In 2007, the Pakistani government formulated a National Policy and Strategy for Fisheries and Aquaculture Development. By formulating this policy, the government recognized the significance of the sector. This was the first time that the government formulated a specific policy or strategy for the development of fisheries and aquaculture. The policy and strategy focuses at institutional strengthening, increasing aquaculture production, improving sustainability in capture fisheries and reducing post-harvest losses.

This policy, describes in detail a framework for development of the sector countrywide including aspects of fisheries and aquaculture pertaining to Sindh. The Sindh Government's Fisheries Department was an in integral part of the body, which was responsible for formulating this policy so the policy has full consent of government of Sindh as well. The Policy however has been shelved and so it has yet not been adopted officially by the provinces and other national institutes who could be the implementing agencies for the relevant portions of the widely agreed policy interventions.

BOX-3

INTER-PROVINCIAL FISHERIES CONFLICT

MARINE FISHERIES MANAGEMENT IN BALUCHISTAN WITH ITS IMPLICATIONS ON FISHERIES POLICY OF SIND- RECOMMENDATION THEREOF

Only Baluchistan Fisheries Department licensed local (Baluchi-owned) vessels/boats can legally fish in the 22 km Baluchistan Territorial Sea. Seines and trawling are banned in Baluchistan. Enforcement of gear restrictions has been somewhat ineffective, particularly in the East of the Province near to Sind, where the trawlers based in Karachi and environs regularly encroach into Baluchistan waters. One of the reasons for this is that Sind waters are very heavily overfished and the returns for fishing boats there are low, so there is an economic stimulus to poach in Baluchistan waters. Fisher folk in Baluchistan are aware of this "poaching" and resent it, but the Fisheries Department has few resources to effectively police its coastline and territorial sea, and encroachment continues. Fisheries department patrol vessels occasionally arrest boats from Sind which have encroached, and this gives rise to conflict between two provincial fisheries departments of Sind and Baluchistan. . Poaching by Iranian boats from the West is also reported. With shared stocks of resources it would be useful to have some sort of resource sharing agreements with both Sind and Iran, possibly through comprehensive management plans for the affected stocks. These have not yet been created.

Given these weak control measures the marine fishery is a de facto open access situation in Baluchistan seawaters as well. With low entry costs, anyone can start fishing in inshore waters.

The Provincial Governments of Baluchistan, the Competent Authority, Marine Fisheries Department (Federal government) and the Sind Government needs to sit down together and come up with an integrated outcome policy option for the upcoming Sind fisheries Policy

The policy guideline should be given in the fisheries Policy of Sind to pursue the Federal Government for a revision in the National Fisheries Policy(as a consequence of 18th Amendment in the Constitution) to promote healthy competition between the fisher folks of two coastal provinces of Pakistan by providing a level-playing field where technical and economic efficiencies in management and production processes and numerous efficient trade corridors for fish export can greatly improve economic returns, reduce wastes and, most crucially increase market access (especially reducing asymmetry in market information) liberalization of trade, and integrated coastal environmental management and above all the improved livelihood

.

SECTION –III

6. Inland Capture Fisheries Sector in Sindh

6.1 The Production (Supply Side)

In Sindh, there are 1209 fishing waters, including ponds, depressions, reservoirs, canals and Indus River. Millions of fisher and semi-fishers (which may not be countable as the data *per se* does not exist for segregating various categories of persons getting their livelihood from water resources of Sindh , mainly fish oriented. The fishermen and all other stakeholders depending on ancillary business related to fish as source of their livelihood fetch their incomes from these natural fishing grounds of the province.

6.1.1 The Ecological Features of Rivers, Modified River System with Barrages and Waterways and Its Overall Influence on the Fish Production Side

About 64 percent of the country's inland fish production share is contributed by Sindh province. In view of the resources endowed to the province (*i.e.* Indus River, canal networks, The irrigation system of Pakistan is one of the largest integrated irrigation networks in the world, serving 14.4 million hectares of contiguous cultivated land. The waters of the Indus River and its tributaries feed the system. The salient features of the system are three major storage reservoirs, namely, Tarbela and Chashma on the River Indus and Mangla on the River Jhelum; 19 barrages; 12 inter-river link canals and 43 independent irrigation canal commands. The total length of the main canals is 58 500 km, with the field ditches running another 1.6 million km. Pakistan agriculture is predominantly irrigated. Hence, the development of rivers for diverting water into canals is basically meant for irrigation supply. However, other uses such as effluent and waste disposal, watering livestock, fishing, recreation, transportation and washing and bathing are also on the increase. Crop production accounts for almost 70 percent of the agricultural gross domestic product (GDP). The major crops are wheat, rice, cotton, sugar cane and maize. Wheat is the leading food grain in Pakistan, and about 79 percent of the total wheat crop comes from irrigated fields. The waters of the Indus River and its tributaries feed the system mainly in Sindh, Punjab and KPK.

6.1.2 Fish Passes, Pumping System and Fish-Protection Devices on Barrages/Head-Works of Sindh.

Only two barrages have been provided with fish passes, however, they do not function properly. *Tenualosa ilisha*, a very popular anadromous species which migrates about 200 km from the coast upstream the Indus River for breeding, is blocked in its spawning migration by an ineffective ladder in the GM barrage. This has resulted in a drastic decrease in its stocks. For that matter, the Chashma barrage fish-way is also not efficient for most of the Indus River fish species. No fish protection devices or refugee for fish are present in canals. Most pumping stations have no fish barriers at the intakes, and where they do exist, they do not work properly.

6.1.3 Tracking other sources of inland fish production from wild

6.1.3.1 Riverine Fisheries per se

The Indus River originates in southwestern Tibet from Lake Nagangla Ringco (31º40'N, 83ºE) and makes a 3280 km trip to the Arabian Sea in Sindh Coast forming the largest delta in the country with a rich nutrient trap for inhibiting fish in the estuaries Fisheries in rivers and reservoirs account for more than 80 percent of total inland fish production. The riverine fishery management system in Sindh is operated mainly by Sindh provincial fisheries departments. They enforce regulatory laws that restrict catch by size of fish and establish closed seasons.

6.1.3.2 Lakes

In Sindh alone there are more than 100 natural lakes of different sizes covering an area of about 100,000 ha hence, Sindh is the richest region of Pakistan in terms of natural freshwater lakes and its fisheries resources Among them Haleji lake (1,800 ha), Kinjhar Lake (12,000 ha) and Manchar lake (16,000 ha) are quite important for fish production. Manchar alone supports 2,000 fishing families. Apart from these big lakes, a cluster of small lakes extend over 40,000 ha. For comparative purposes, one would like to know that in Punjab which is by far the nearest competitor in terms of number of lakes and lake area, the areas under various lakes is about 7,000 ha. Some of the lakes, such as Namal lake (480 ha), Uchhali lake (943 ha), Jahlar lake (100 ha), Kallar Kahar (100 ha), Kharal lake (235 ha) and Khabikki lake (283 ha) are brackish and are too saline to support aquaculture. Other manmade lakes include Mangla dam, Terbela dam and Chashma Barrage.

6.1.3.3 Flood Control Compartments and Fisheries

Along the Indus River, for about 150 km between the Guddu and Sukkur Barrages, there are numerous flood control compartments with water control gates. They range in size from 10 to 5 000 ha each. Under normal operating procedures, these compartments are filled during the rainy season and subsequently drained a few months later after the floods have subsided. However, the peak flood period also corresponds with the peak of fish spawning.

6.1.3.4 LBOD and RBOD in Fisheries Context

An in built problem with the canal system is seepages. The losses from watercourses are between 10 to 20 percent with a maximum of 40 percent, half of which is due to evaporation losses while the rest seeps downward. The seepage water recharges the groundwater of the Indus plains. The seepage water has created problems such as water logging. But the seepage water has also resulted in creating large fisheries resource which is regularly being exploited as one of the most lucrative fisheries business in the province. To cope with this problem open surface drains and pumping of groundwater has been carried out on a massive scale This has given rise to the construction of RBOD and LBOD which culminate near Thatta creating massive water bodies now used for raising fish. These drainage canals have their own problems and even for managing waters and fisheries therein in the depression areas and at such a large scale needs proper understanding and appropriate technology.

6.1.3.5 Inland Fisheries Management; Overall Scenario

Inland Fisheries Management is the responsibility of an Inland Fisheries Department reporting to the Sindh Fisheries Department. It is based in Hyderabad, with Deputy Directors and Assistant Directors on district levels. Key responsibilities include management of capture fisheries of fisheries in freshwater bodies, aquaculture and culture based fisheries, registration of fishermen and fishing vessels and issuing of fishing licenses, enforcement of other provincial

legal provisions, surveys of water bodies, extension services, collection of fisheries data, sanitary and quality control of landings, development of landing facilities, auction halls, markets, and cold storage etc.. The mandate also includes promotion of stakeholder participation in fisheries management, assistance to fishermen communities and safeguarding and enhancement of the environment.

6.1.4 The Fisheries Management Side of River Modification

The entire riverine and regulatory system along with barrages and canals system are on a continuum running downward towards Arabian sea from north to southward hence the system is to be looked as one both in terms of ecology , natural resources and the management therein. However this is not the case as there are provincial boundaries with their respective river and canal management systems viz a viz fisheries management system and control function vested in the respective Fisheries Department of province. And, at Federation level there is no single coordinating unit to develop a cohesive policy and its implementation for the riverine fisheries of Indus river system and in its basin. Due to the creation of the canal irrigation system, the Indus river system comprising of four other rivers, is now almost completely modified along its course creating a lot many small water bodies/reservoirs associated with water regulatory structures built upon them. Hence, the rivers as such are now the modified water bodies with very limited ecological characteristics of small and/or large rivers. Even streams feeding the river system have lost their ecological significance on the face of river modification. It can be imagined that about 220000 tones fish obtained from all inland waters, 80 percent is being captured from a network of rivers, irrigation canals and lakes. It is hard to segregate the Sindh fishery data from canal system lying in Sindh from the rest of the national data due to crunch in data collection and analysis thereof at provincial department level.

In Sindh like other parts of the country the Fisheries are the secondary users of reservoirs head works and barrages. Fisheries management in water bodies created from water regulatory structures is still very poor everywhere in the Indus river basin with no exception in Sindh. There is no effective data collection system, which would assist with determining factors contributing to sustainable use of these artificially created huge water bodies for fisheries. But it is realized that repeated and unorthodox releases of fish seed produced from hatcheries is an important measure for enhancing dam and barrage /man-made reservoir fish stocks. Canal systems have been given low attention in terms of realizing their potential for fish production. Active canals are rarely managed for capture fisheries and there is no cage or pen culture. However, abandoned irrigation canals are to some degree utilized for fish production. Flood control compartments are often stocked naturally with wild juvenile fish, including major carps and other food fish, during floods. Large areas of wetlands resulting from irrigation practices have considerable potential for fisheries development. To further improve the fisheries in massive water bodies of irrigation systems (and rather main production source of capture fisheries in Sindh) , and for that matters the river, will require better planning, improved data collection and evaluation, improvements in infrastructure, better coordination among fisheries organizations, and enforcement of fisheries regulations. And this all is not possible without precise capacity building of the FDS through following a focused program of training and subsequent infrastructural development support.

6.1.5 Types of Capture Fishes and Fisheries in inland water bodies and management aspects

There are three types of capture inland fishery: floodplain, leasable and open water. The floodplain fishery is a seasonal fishery that takes place at the end of the monsoon when the waters recede from the Delta. During this time, fish either become trapped within water pockets of small lakes and ponds or they follow the receding floodwaters into rivers and their tributaries. The leasable fishery is also seasonal. It is practiced in streams and various forms of water

catchment areas. Fishing operators obtain temporary lease agreements to operate within these areas. The open water fishery occurs in permanent freshwater bodies such as streams, rivers and lakes. The species caught are highly demanded fish including air-breathers, snakeheads, minor and major carps, freshwater shark, and about 40 more commercial species that are marketable for human consumption. Significant feature of freshwater capture fisheries is the unique Palla fisheries found nowhere else in Pakistan except in delta and upward in Indus river up to GM Barrage. Of the total inland catches within this fishery, 96 per cent area is accounted for by private fishers. The rest is accounted for by the public sector or at subsistence level by the fishermen that cannot be called commercial fisheries in a way cooperative sector.

6.1.6 Capture fisheries Production and employment Trend in Sindh

About 64 percent of the country's inland fish production share was contributed by Sindh province. In view of the resources endowed to the province (*i.e.* Indus River, canal networks, reservoirs, lakes, stream, water logged area and village ponds) fish production share can be increased up to 90 percent with proper use of these resources. However, with the diversion and control of the river and canals under the Indus basin treaty works, water regime has been distributed and the natural breeding grounds of fish have been ruined. Consequently, the potential for increased fish production from the riverine and flood plain fishery has been restricted. Hence, the major potential for increase in fish production lies in fish farming on commercial scale especially on water logged areas. Sindh has more than 1050 thousand hectares of area water logged. The total number of persons engaged in fisheries sector is estimated at 400,000. Out of which about 62.2 percent are engaged in inland fisheries and about 37.8 percent are engaged in marine sector

6.1.7 Inland Fish Production: Sindh's Share in Pakistan's Total Fish Production

The share of Sindh in total fish production of Pakistan is in the tune of 68.2 percent while the share of inland fish production in Sindh is 18.3 percent. The share of Inland capture fisheries is about 63.8 percent of the total national catch of the country. However, the relative composition has exhibited a fluctuating trend.

6.1.8 Major Inland Fish Stocks, Biodiversity and Population Decline/Extinction

There are approximately 200 species of fish in freshwaters of Pakistan (including Sindh), of which a number are endemic. Substantial quantities of commercially important fish are caught from rivers. The inland commercial fishery encompasses about 40 species of which the significant ones are: *Labeo rohita, L. dyocheilus, Catla catla, Cirrhinus mrigala, C. reba, Channa striatus, C. marulius, Aorichthys (Mystus) seenghala, A. (M.) aor, Wallago attu, Rita rita, Bagarius bagarius, Tenualosa ilisha, Notopterus notopterus, Tor putitora,* The exotic species, which have managed to escape into the natural systems and have thrived there, also make a small contribution to the total landings from rivers. These include three species of tilapia, three Chinese carps, and common carp

While none of the species are yet recognized as endangered at the national level, at least two of commercial importance, i.e. *T. putitora(Mahseer)* and *Tanalusia ilisha (Hilsa)*, may attain the status of endangered species soon if steps are not taken to conserve them. *Tor* migrates from floodplains to the Himalayan foothills for breeding and the creation of Mangla and Tarbela dams blocked its migration. *T. ilisha* needs to migrate upstream from the Arabian Sea to breed but

ineffective fish ladders in the Guddu barrage on the Indus River hinder the migration. concern.. Habitat loss has also resulted from organic and other types of pollution, including discharges of toxic substances. Consequently, those species with limited distribution and critical habitat requirements may disappear from inland waters of Sindh like other parts of Pakistan due to habitat loss or modification. In-depth research is imperative, not only to determine distribution, taxonomic status, population has size and habitat requirements of these species but also to devise a rational conservation programmed for their protection. The research should culminate in a program of establishment of sanctuaries, nurseries for salvage of juveniles during floods, and hatchery techniques for artificial breeding of vulnerable species.

6.1.9 Freshwater Ecological Flow Requirement for Sustaining Fish Productivity in Riverine and Delta Systems in Sindh

Needs to be determined for determining the minimal levels of freshwaters required to flow into river system part of the Sindh to sustain fish life in the system and ancillary rather most important to determine the flow of freshwater needed to feed the delta and its mangrove forests (which is the life line for fish production for coastal regions by providing breeding grounds for shrimp and other commercial important species ,particularly inhibiting in the mangroves) Once this level is determined scientifically then the Indus flow should be considered as important for the wetlands/fishing grounds as is being considered for agriculture. As per the case , the water availability for the wetlands and fishing grounds must be ensured through guaranteed water shares besides providing water share to agriculture, industries and urban consumers. The issue needs to be actively pursued in the Council of Common Interest (CCI) at the highest level

6.1.10 Unauthorized occupation of fish natural breeding grounds

Major fishing grounds/lakes in different districts of Sindh are said to be practically occupied by the influential landlords of those areas who avail themselves of the right for fishing in these areas, generally exploiting the local poor fishermen. A very effective policy is needed on this issue with a sense of participation from all stakeholders and after a series of public private dialogue.

6.2 Freshwater Capture Fisheries Marketing (Demand Side)

6.2.1 Markets, Market Chain and Margins

Sindh has a domestic and an international market for freshwater fish coming either from capture fisheries or from aquaculture. Moreover, there is no distinction in the marketing channels and marketing intermediaries when it comes to products (fin fish, freshwater prawns and fish products) from wild freshwater sources or from farms.

6.2.2 Domestic Market:

At domestic level the catch from inland fisheries as well as aquaculture is supplied to the local fish markets. Frozen or processed fish is supplied to only a few large departmental stores in some cities

6.2.3 International Market:

At international level Pakistan has a market for freshwater fish like fish and fish products from marine sources. Freshwater fish are exported to European Countries as well . Major markets for export are Malaysia and the, Gulf.

6.2.4 Fish marketing, Pricing and Margins

Both marine and inland fish are marketed in Sindh as described earlier. Urban Sindh which is a coastal barely, re supplied mainly by marine fisheries while the inland/interior regions/cities of Sindh provinces are mainly supplied by inland fisheries. The inland fishery products are marketed in all major markets of the urban centers/ cities. The fishermen bring their catch by boats to collection points on the shore of the lake/reservoir/barrage or river. There the contractors/collectors collect the fish, place them in woven baskets or burlap bags with crushed ice and then transport these, on a daily basis, by public or private transport to the major(wholesale) markets called "fish arrhat". The Sukkar fish market is the largest of the freshwater markets in country both in terms of volumes which the market disburses and the variety of fish. The fish is auctioned here, based on grading by weight/size, species and quality. The availability of fish in the retail market is not only limited but is characterized by irregular supplies, low number of vending slots and inferior facilities for storage, distribution and marketing.

Fish weighing 2-3 kg fetch prime prices in the market. Each fish species has its own price the freshwater catfishes like freshwater sharks, seenghara/ tengra and soles weighing 2-3 kg each are sold in the whole sale market at the maximum price, in the tune of about Rs 400-500/kg. Followed by rohu which gets a price of about Rs 250/kg; other carps of the same size are sold at about Rs 225. The Chinese carps as well as minor carps fetch up to Rs 170 /kg.

The price is also dependent on the degree of freshness and the market demand/supply situation. The market itself is seasonal with best prices during the coolest winter months. Other factors which affect fish price include location of the market (city, for instance), species of the fish, closure of canals for removal of sand (for a month during the first calendar year). The new dimension is floods since the fish farmer catch their fish in panic and try to market them at a throw away price. This is panic marketing of freshwater fish. And during these months (which are generally in late summer) the market is flooded with farmed carps and the prices are at the lowest level and so are the margins for all the market players. In the following winter, the effect of this flood season market can be observed on the market prices, which are at the most exorbitant rates that season due short supply of residual catch from wild sources. The floods also tend to spread the marketable fish indiscriminately drifting them into floodplains where their fate could be anything ranging from mass kill to ‘free for all commodity “in a sense like open access fishery. There is no system in Sindh and for that matter all over the country to salvage the trapped fish in pools formed after floods.

Another aspect of flood is that it occurs following the breeding season of carps and other important consumable riverine fishes, so the fingerlings are lost in millions affecting the population structure and size of inland capture fisheries in the subsequent seasons.

6.3 The Marketing Chain and Profit Margins

The marketing chain is very simple and as mentioned earlier, very short. The fishermen or the fish contractor brings the fish to the wholesale market bearing cost of harvesting (Harvesters charge at a flat rate of 20 percent equivalent of the price of the fish in the wholesale market, for each fish they catch), cost of ice and transportation from production site to the market, cost of

labor and off course paying all the octopi at the check posts on national highways/roads he travels with is marketable fish. In the wholesale market, there are commission agents sort of marketers called ARRATHI. They do the sorting and grading of fish at their specified premises within the market and ice the fish. The cost incurred on fish sorting, grading, icing and even storage for some duration of time and auctioning to the vendors is the responsibility of Arrathi and for provision of these services, he charges from the fishermen/contractor/farmer, a flat rate of 2.5% of the cost at which the vendor buys the fish. This cost is borne by the producers. The margin or the producer from wild could be as high as 70 percent.

It is estimated that post-harvest losses from river capture fisheries are 20 percent. Inferior handling and distribution, inadequate infrastructure and poor marketing practices characterize the marketing system.

6.3.1 Comparative account of Fish Consumption in Sindh- the Demand Side

On the face of overall low per capita fish consumption in the country, it is still comparable to note the difference in per capita consumption of fish in various provinces of Pakistan. It has been distinctly found and reported a few years back reporting tremendous variation in per capita consumption of fish within the country. Baluchistan is on top with 5.28 kg per annum; followed by Sindh at 2.98 percent (some ten years ago the reported per capita consumption in Sindh was 4.25 %. Punjab and KPK have shown slight enhancement in their per capita consumption rate of fish over the period of time and is in the tune of 1.00 percent and 0.8 percent. This indicates that fish in Sindh occupy a prominent place in consumer's diet (though its consumption has decreased). One factor limiting the increase in per capita consumption of fish is found are the increased prices of fish making this commodity out of reach from many of its enthusiastic seekers. Further, an efficient marketing system providing timely fresh fish of prime quality to the consumers at affordable prices (which is only possible if the supply side has a tendency towards surplus in markets which in itself is possible when production goes up). The poor marketing infrastructure can be witnessed by the fact that there are very limited retailing outlets for fish an both urban and rural centers, in fact the rural places are devoid of such outlets , sometimes altogether. Unlike mutton and beef, for which there is prohibition of its sale on two days of week (Tuesday and Wednesday) the fish and poultry enjoy exemption from this law. Nevertheless the consumers free and fair access to fish is still a big problem during the days when there is legally no restriction on its sale (the sale of freshwater fish is prohibited during two months of breeding of freshwater fishes, falling in June and July).

SECTION III

7. Aquaculture

7.1 The Production (Supply Side)

7.1.1 Performance of Aquaculture Resource in Sindh in Overall National Scenario

According to FAO's different reports, the Aquaculture continues to grow more rapidly than all other animal food-producing sectors globally. And worldwide, the sector has grown at an average rate of 8.8 percent per year since 1970, compared with only 1.2 percent for capture fisheries and 2.8 percent for terrestrial farmed meat production systems over the same period. The aquaculture sector has also been growing steadily (albeit at a slower pace) despite Fisheries and aquaculture sector in Pakistan receiving less priority in policy planning and public investment.

Only two mega projects (funded by Asian Development Bank) were initiated and completed throughout and most of the present infrastructure in the Punjab, KPK and Sindh was developed under these two projects. The Baluchistan and Gilgit Biltistan (GB) were not included in the work plan of those projects. Recently another project titled Aquaculture and Shrimp Farming was initiated by federal government but it was prematurely closed due to devolution process.

An in-depth analysis clearly indicates that the sector utilizes only around 1 percent of the available water resources. Waterlogged areas (56 percent) and flood water areas (18 percent) give a haphazard fisheries production as there are millions of hectares of waterlogged areas created due to massive irrigation systems, and as per one of FAO's finding practically no attempt has been made to use these water bodies for fish culture. Careful planning is needed for judicious use of these underutilized areas for productive fish farming. The situation is further aggravated by the fact that the average growth of aquaculture area and production are divergent to each other as far as the Sindh province (which hosts around two thirds of fisheries resources) is concerned.

Another impediment to the sector is its data deficiency, particularly in Sindh. Either the data is lacking or its reliability is questionable. This can be gauged from the fact that the data of fish farms and the fish production both seem on lower side because there may be hundreds of fish the data of fish farms and the fish production both seem on lower side because there may be hundreds of fish farms which are not reported or could not be surveyed by the fisheries departments due to their meager manpower resources, non-availability of sufficient operational funds, vehicles and other difficulties including the law and order situation. This can be supported by the fact that only in one district i.e. Shikarpur a difference of more than 500 percent was found in data available (1994) and the survey conducted in 1996. According to the survey 8008 acres were recorded as compared to 1436 previously recorded in District Fisheries Office. Hence, it is considered that as much as 25-40 percent of the fish pond is considered to be missing from the official record. This situation demands extensive surveys to be carried out in Sindh especially in remote far flung inland areas, to bring out the actual fish/shellfish (if any) farming figures for management planning and services support .

According to various partial surveys, the share of aquaculture in Sindh in 2008 is depicted in the following pie chart.

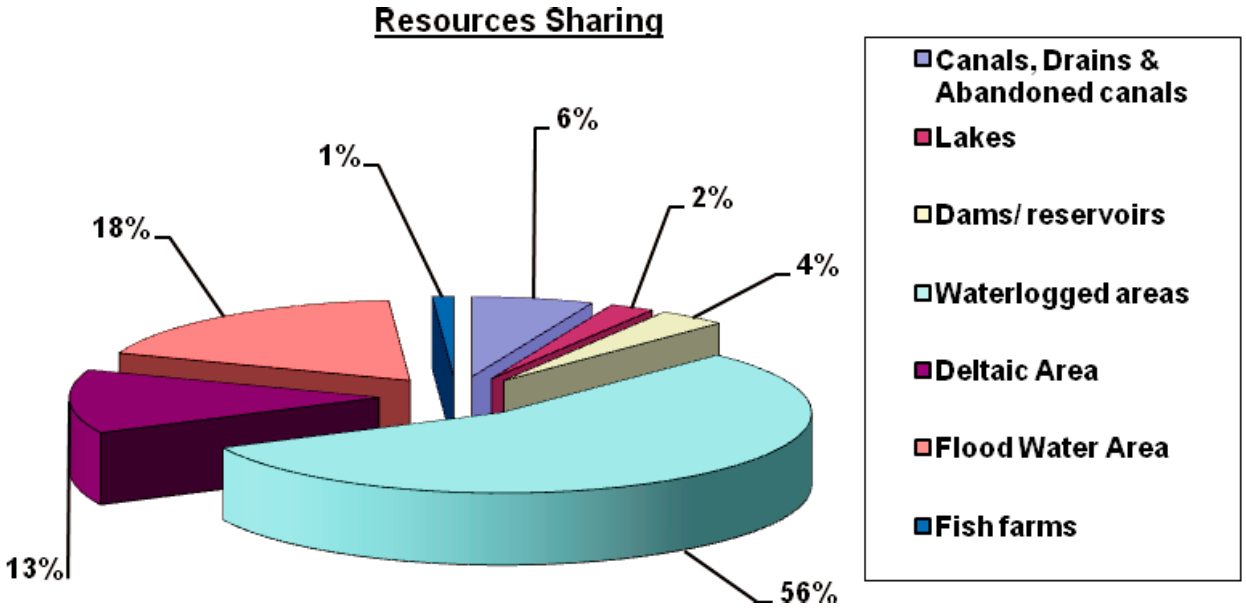


Figure 5 Sources, Jarwar, A.M.A (2008) Aquaculture Asia Magazine

In terms of reporting aquaculture production to international organizations as well, the authorities concerned have slacked tremendously, the last time the Fisheries Development commissioner's office reported officially to FAO about our total aquaculture production in 2003. Although FAO estimated aquaculture production of 140,000 tones for Pakistan in 2010, the total aquaculture production was estimated anywhere between 110000- 150000 tones now according to the consultations held with the various stakeholders during the mission.

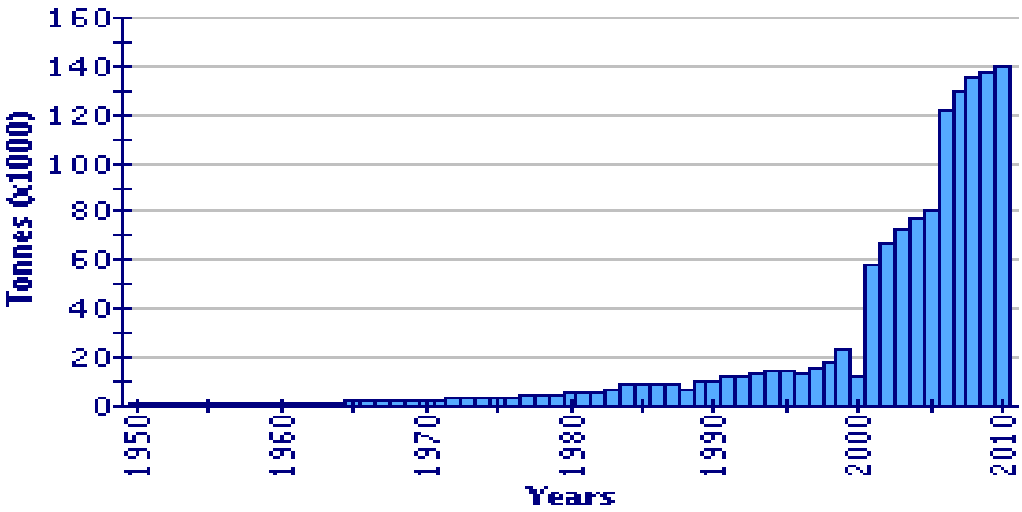


Figure 4 Trends in Aquaculture Production in Pakistan

Source FAO (2012)

If the estimate stands true, it would suggest that the aquaculture sector did not achieved substantial development in the past decades. Insofar as the share of Sindh in total aquaculture is concerned, it is estimated that it is about 60-63 percent of the total aquaculture production in Pakistan as per one of the findings consulted during this mission giving the distribution status of farms in Sindh.

The decentralization of fisheries and aquaculture development to provincial government complicates record keeping and developing a harmonious database at national level for coordination.

7.1.2 Structural organization of Sindh Fisheries Department and Lacuna in Functions for rational management of various Fisheries and Allied aquaculture

The organization of the Provincial Fisheries Departments was wanting at the beginning of aquaculture activities during the 1980s, and to some extent is still in a similar position in Baluchistan and NWFP provinces. In Sindh a number of organizational and reorganizational changes and reforms took place, headed by the Director General Fisheries, which along with DG Livestock reports to the same Secretary for administrative management This reduced the overall performance comparatively as opposed to an arrangement with a full-fledged Secretary of Fisheries in Sindh Government. The various Directorates which are functional under the Director General have already been elaborated earlier in the report. There is a paucity of trained manpower, given the gigantic job functions, the department has to perform. In fact, it has to cater to the needs of all three facets of fisheries (Coastal fisheries, Capture fisheries and aquaculture) which are wide-ranging and diverse in nature of function. Intra departmental transfers and postings are independent of the three varied types of functions it performs, The same manpower could be employed for freshwater capture fisheries management which works in the area of marine fisheries management, like wise there is no specialized cadre for aquaculture specialists in the department. Therefore, one officer who has taken, say international training in marine resource management, is not essentially bound to serve he marine sector, he could still be deployed for capture fisheries Management. There is also no distinction in cadre for research personnel and a development-oriented managers. Likewise there is no planning wing in the Directorate, which could have a battery of professionals to develop long term and short term strategic policy for aquaculture development and management in the province.

While the department has no doubt moved from scratch to this functional size for improving its overall efficiency, one very important department which is lacking is research and related development for conducting policy or production-oriented research to help support the growth process in the relevant subsectors on rational lines. At least two research institutes are needed at the Departmental level; one a policy research institute; and the other developing and augmenting the aquaculture and riverine as well as lake fisheries in the Sindh.

7.1.3 Fish Culture-Based Production System: Step Forward Towards Aquaculture System Intensification

The province of Sindh falls in warm water zone of the country where freshwater framing is largely practiced in earthen ponds of varying sizes. The variation in size alone is factor, which is significant enough of fish farming system in Sindh. Starting from a few Kanal (one eighth of an acre ponds, some individual “ponds” are larger than 200 acres in size. These big-sized farms would be unmanageable in term of adding inputs as well as in getting the fish outputs. Water quality management and fish stock management, and how to maintain the balance between the desired species and the undesired species (growing uncontrolled in the large systems) would also be problematic. These systems are poor aquaculture systems and can be categorized as the lowest form of extensive aquaculture system, which is simply like put fingerlings, wait and then after a year or so take them out for market. The system has very low productivity on per unit area basis. Wherever possible they need to be compartmentalized into manageable units for enhancing their farm production and more importantly for regular annual harvesting exercise.

Coming to relatively better managed earthen fish farms, the quality of carp pond design and construction is highly variable, some commercial farms are well built and managed, however, many more are in need of technical and management assistance As pointed out earlier again it may be noted that with the exception of a pilot shrimp farm in Sindh and trout culture in raceways system in Northern Areas of Pakistan and some areas of NWFP, virtually all aquaculture in Pakistan consists of pond culture of various carp species to which some new cultivable species are knocking door for entry into the system such as channel catfish, tilapia and pangassius However, carps which are the mainstay of present day farming in Sindh and that matter in Pakistan are cultured in earthen ponds utilizing extensive polyculture farming systems with addition of very little inputs to moderate level addition of inputs such as fertilizers but from the point of understanding ,as there are two major types of farming like extensive farming and intensive farming , these farms can be termed as extensively farmed farms.

When the use of fertilizers is replaced or supplemented by artificially manufactured fish feeds then the system is termed as intensive system .Now how much intensification ; again it depends on the use of quality of feed and its amount and if there is provision of externally sourced oxygenation for the system or not. Coming to the current level of farming in Sindh ad based on their practices, most of the provincial framers are mostly extensive fish farmers characterizing their productivity in low productivity zones of aquaculture.

Some farmer are switching over to semi-intensive culture system with use of high quality fertilizers and even supplementing feeds (which generally are not pelleted high quality and fully balanced feed at all). A variety of stuff I used as feed ranging from dried roti (Bread) to rice polish/bran or wheat bran with seldom addition of oilcakes in the feeds. Now, however, for the first time, well formulated pelleted feeds, including even floating feeds, are being produced in the country on commercial lines (though it is still in pilot phase). This could lead to breakthrough in the development of aquaculture industry in Pakistan and for that matter, especially Sindh fish farmers could be the best beneficiary of this feed considering that Sindh is the largest aquaculture province of Pakistan .

At present a combination of five or six of the three indigenous species of major Indian carps as well as three exotic species of Chinese carps is cultivated in the ponds. There is in fact arbitrary selection of species for polyculture , mostly depending on availability of seed of a variety at a given pint in time . The stocking ratio for various species in the system is therefore also determined by the farmers after years of self-practice or based on some advice from FDS Extension staff. Generally the reliability of Farmers on the FDS staff varies from farmer to farmer. Most new entrants begin their venture with the guidance of FDS Extension Staff however , on a typical farm in Sindh it was found that, the ratio of the warm water species stocked is as follows: catla (10-20 percent), rohu (30-35 percent), mrigal (15- percent), grass carp (15-20 percent) and silver carp (15-20 percent).

The intensive culture of these species has not yet been popularly adopted so far, the major impediment to this development is the deemed non-availability of low cost feed and to a greater extent to the non-availability of intensive fish farming technology. The productivity of carp farms show marked differences across the various provinces with Punjab having the highest per unit production followed by Sindh and NWFP .

7.1.4 Cultured Species

In the past, most fish farmers stocked their ponds only with indigenous species such as catla (*Catla catla*), rohu (*Labeo rohita*), mrigal (*Cirrhinus mrigala*) and common carp (*Cyprinus carpio*). More recently, two fast growing species, the grass carp (*Ctenopharyngodon idellus*) and silver carp (*Hypophthalmichthys molitrix*), have been introduced for culture under modern polyculture systems to increase the fish yield per unit area. These two species have good

economic values; have gained a reputation and became popular amongst the producers as well as consumers.

7.1.5 Carp and Shrimp Hatcheries

Freshwater carp farming which is by far the mainstay of aquaculture activity in the country is practiced widely in the two provinces of Punjab and Sindh and to a lesser extent in the province of NWFP. In Punjab, 74 fish hatcheries are operated by the private sector while 14 hatcheries and nurseries are operated by the public sector. There are 5 hatcheries in Sindh, located at Chilya (Thatta), Mirpur Sacro and Sukkar. In Balochistan, there are only a couple of hatcheries; 8 warm water fish hatcheries and about 30 trout farm cum hatcheries are operating in the NWFP. The DOFs provide technical guidance, juveniles at subsidized rates to farmers as well as other extension services, which have resulted in the establishment of a number of trout hatcheries/farms under private ownership.

The government has also successfully transferred the technology gained by the Provincial Fisheries Departments to the private sector and as a result, the number of farms is increasing.

Efforts toward the establishment of shrimp farming in Pakistan begun in the early 1980s when the Government of Sindh began the establishment of a pilot scale farming at Garho in Mirpur Sakro District.

At the same time, the Sindh government allocated 17,000 acres of land in the area to about 80 prospective shrimp farmers. However, because there was no local production of seed in Pakistan, all those involved had to import seed from Sri Lanka and Malaysia resulting to high mortalities experienced. Due to the lack of expertise, none of the pilot farms managed to continue in operation and all shrimp farming activities ceased by 1990. The government, however, took note of the potential importance of shrimp farming and again initiated efforts to establish a shrimp hatchery complex at Hawks Bay which started operation in 2001. Successful rearing of post-larvae was achieved at this hatchery in 2002. A privately run enterprise has successfully cultured the seed from this hatchery and subsequently produced about 3.0 tonnes of shrimp that were later exported. The government of Sindh and the National Institute of Oceanography has since taken over operation of the hatcheries established at Hawks Bay and another at Clifton near Karachi and very recently seed has been produced which is now being reared at the Sindh government's facilities located in the Garho area. With the success in seed production using indigenous species, it is expected that commercial scale shrimp farming begin in the near future. The Government of Sindh has also proposed potential areas for the development of shrimp farming.

7.2 Aquaculture Product Marketing (Demand Side)

Farmed fish marketing chain is almost in line with those of other agricultural commodities; the products are sold into the market to wholesalers and then onto retailers and end consumers through agents working on commission basis or vendors. Farmed fish tend to be marketed either at the farm gate, through middlemen or during open auction where ice-packed fish sent to fish markets after harvest were sold. Buyers can be members of the public, retailers, wholesalers, agents for processing plants or exporters. Fish markets are very common in Sindh, both at selected locations as well as non-localized places this is unlike in Punjab where all markets are generally at selected places. The markets deal in fish from all sources with no distinction or exclusivity for aquaculture products specifically. All markets are under the control of the local administrations. The markets are closed for freshwater fish sale during two months of “close season “during summer which is observed for letting the fish breed under natural freshwater conditions to sustain fish populations for captive fisheries. This has a spillover effect for aquaculture product sale as well so the aqua-cultural products are not marketed during the

close season All fish markets have inadequate facilities; usually they have poor and more traditional cold storage facilities, have poor hygienic conditions and inadequate communication links, etc. Most aquaculture product is consumed locally with only a small portion being exported.

In terms of consumer preference the Rohu (Labeo rohita) has a substantial local preference and market thereof followed by Catla (Catla catla) then comes the rest of the carps. The lowest at the ebb are Chinese carps , particularly silver and big head carp . For fetching premium price, the good market size is usually above 2 kg and up to a maximum of 3 kg. Prices tend to decline when the fish is more than 3 kg in weight; other factors include freshness of the fish and the supply/demand situation in the market. Fish is a seasonal commodity with most consumption during winter season. In addition, to get marketing edge, most of the fish farmers tend to bring their produce in the market during winter months and they are able to achieve best prices during the winter months. In the wholesale market, the carp price ranges from US$ 1.5 - 2.5 per kg in local markets.

In terms of consumer, preference there seems an arbitrary divide between the rural and urban Sindh. The local consumers mostly in rural Sindh, generally prefer freshwater fish over marine fish because of their familiarity with river and inland farmed fish as well as the fresh condition of the product. This difference is reflected in both wholesale and retail prices where freshwater fish sell at a higher price than marine fish. In urban Sindh, the consumers have more affinity for marine fish.

7.2.1 Aquaculture Development Prospects

The aquaculture sector has received a substantial amount of government investment over the past decade and facilities are now in place that can provide the basis for a major expansion of aquaculture production. Starting from two Aquaculture development programs funded by ADB which provided assistance mainly to Punjab and Sindh supporting aquaculture infrastructure had a more precise impact in Punjab where mass production of eggs and juvenile fish provided the basis for major expansion enabling mass level supply of fish seed to their framers from government hatcheries . In Sindh, the hatchery system could not develop to that an extent and still availability of fish seed for culture system is problematic.

Sindh is striving now for new hatcheries and needs a better capacity building of its staff for making the existing hatcheries operational at an optimum level. Despite several attempts by both the private and public sectors, aquaculture in the coastal areas of Pakistan has not yet been successful despite good potential. In almost all maritime countries, marine aquaculture has proliferated and became a major source of raw material for the export of seafood commodities. In the absence of a major aquaculture sector in Pakistan, it has not been possible to compete with nations, which have this alternative and dependable source of raw material for export.

No commercial fish feed is currently being produced in Sindh Pakistan; however, some experimental feeds have been prepared and utilized very effectively. Small pelagic caught as a by-catch from shrimp trawlers as well as fish offal are used for the production of fish meal on an industrial scale. About 189 134 tons of small pelagic were landed, yielding 42,230 tons of fish meal according to the latest reports. Some progressive fish farmers are using fishmeal and or trash fish in aquaculture operations but it is not a common practice.

Another interesting aspect of aquaculture development in Pakistan is that the Aquaculture began in Pakistan as a small-scale sideline of crop farmers; however, with the emergence of fish hatcheries operated by the public sector, there is a movement towards larger fish farms particularly with the entry of businessmen into this sector. This effect, however, is area specific

and confined to areas close to big cities such as Lahore and Multan as well as in Sindh where people have large land holdings; the management of large water bodies and the construction of large farms are now common here.

Compared with the aquaculture production increase of 80 percent in Asia in the past 10 years, aquaculture development in Pakistan has lagged behind most of the countries in the region. The gap between Pakistan and other Asian countries is not just limited to the production; it is also evident in the development of culture technology and diversification of cultured species. Many countries in the region have well developed and diverse kinds of aquaculture systems in inland, marine and brackish water bodies with different culture technologies, such as pond, cage, pen, close system with much diversified species. Aquaculture is still limited to pond culture of mainly carp species and recently started tilapia and catfish. Therefore, hard efforts are needed for Pakistan to catch up with regional aquaculture.

Identified potential areas for Business in Fisheries Sector of Sindh ; Small or medium sized business in Fisheries sector offers many opportunities in Pakistan. But it is important that those who want to select & pursue such business should have some knowledge, experience and most importantly passion for the Fisheries sector. Below are the summarized versions of the pre-feasibility reports by SMEDA on some of the Business especially in Sindh in its Fisheries sector to get an idea of the potential's worth.

1 Inland Fish Farming (Region: Feasible locations of Sindh and other regions in the country)

Investment Size: PKR between 1-2 Million

The project is about establishing an Inland Fish Farm in the potential areas of Pakistan which provide desired suitable environment. The project would serve as facility to utilize the everyday resources in the form of feed for inland fish farm that usually ends up as cultural waste. On the other hand it would generate employment for the local inhabitants and more over would possibly cause cash inflow as well. Currently the project is being designed / proposed for the high temperature areas/cities such as Sibi and Jacobabad, however the same can be proposed for the areas which can fulfill input and logistic requirements of the project. The proposed project is primarily focused on the local customers and national markets due to the prevailing high demand and taste preferences. The main feature of the project would include naturally grown fisheries in clean environment keeping in view the quality standards and principles. This prefeasibility study explores the viability of setting up inland fish farm based on economic and technology trends and available local strengths, weaknesses, opportunities and threats.

Shrimp Farming; (Region: Sindh)

Investment Size: PKR between 1-2 Million

Shrimp farming, the production of marine shrimp in impoundments, ponds and tanks, got rolling in the early 1970s, and, today, over fifty countries export farmed shrimp. In Ecuador, the leading producer in the Western Hemisphere, export revenue range from $500 to $800 million a year; in Thailand, the leader in the Eastern Hemisphere, they have passed the billion-dollar mark. In addition, India, Indonesia, China, Malaysia, Taiwan, Bangladesh and Sri Lanka all produce huge amounts of farmed shrimp. The Philippines, Vietnam and Myanmar (Burma) have shrimp farms, and there are shrimp farms throughout Central and South America. Honduras, Panama and Mexico have big industries, while smaller industries exist in Colombia, Venezuela, Nicaragua, Peru, Belize and Brazil. The shrimp importing nations, the United States, Western Europe and Japan-specialize in high-tech "intensive" shrimp farming, but, thus far, their production has been insignificant. Shrimp export has a major share of the total seafood export of Pakistan. It is almost 60% of the total fisheries export of the country. The annual catch of the captured shrimp has been constant and we have reached the sustainable limit of shrimping. In order to increase the shrimp exports we have to go into shrimp farming. Farmed/cultured shrimp in Pakistan is non-existent in Pakistan.

7.2.2 Limiting factors for aquaculture development

Based on the consultations with different aquaculture stakeholders from Islamabad, Sindh Province, the following four areas of concern limiting aquaculture growth is being identified.

7.2.2.1 Lack of Clear Fisheries Policy and Effective Regulatory Framework

A very comprehensive national policy and strategy for fisheries and aquaculture development in Pakistan was developed with the assistance of FAO in 2006. Based on the consultations with all the provinces, which still is held in abeyance and with the 18th Amendment, there is little prospect for any province to adopt it *per se*. Moreover, since 2011 due to Devolution, the fisheries and aquaculture are the function of provinces, the provincial policies and strategies need to be prepared for sector development.

There are no direct laws applicable for regulation of aquaculture industry in Sindh as is the case in other parts of the country. It may be worthwhile to note that “aquaculture” or fish/shrimp/prawn /or any other aquatic plant or animal farming specifically has not been expressly defined in these laws which appear to have been regulatory laws up until now.

Investors in fish and shrimp farming, fish processing or fish capture do need a legal cover for the protection of the investment they make by adequate rules and regulations. Such rules are inexistent at present Therefore, there is a great need that Sindh Government should take up the issue and prepare relevant laws and regulation for diverse aquaculture sector in Sindh. The laws should be categorically clear on issues like prohibitions, restrictions, requirements (e.g. effluent standards; receiving water standards). Even for making a framework policy, it is believed that the FDS will have to build its human resource capacity and once developed, capacity building for its implementation.

7.2.2.2 Lack of Enabling Environment

There is a lack of enabling environment for aquaculture development, which includes current land and water tenure and lease policy, lack of credit and insurance schemes for aquaculture investment, lack of public infrastructure needed for aquaculture development (transportation, marketing and power supply etc.), lack of technical backstopping like ‘service provision, training, education and awareness raising’ and research backup by the government, lack of financial and investment incentives (duties and sale tax exemption on imports, subsidies, special loans, special rates of power, cheap inputs etc.), lack of market incentives like certification and labeling. Improving access to finance is a key and there is a need for dialogue with Banks and develop models that allow equitable access for small farmers as well as necessary finance for SME's. Government may establish a fund for aquaculture development to support local investors, and provide tax holidays for at least 10 years.

7.2.2.3 Poor to Nil Aquaculture Research and Week Extension Service

Practically no research institution exists that conducts substantial research in addressing the practical needs of aquaculture sector at provincial levels. Consequently, there is a dearth of qualified technical staff at provincial and district level, which would normally provide adequate extension services to the private sector. Fisheries/aquaculture staff at district level does not have opportunity for needed professional training and knowledge updating. Better cooperation among public, private sector could lead to better results off course. Aquaculture parks should be developed, in different environments, where model farms can be established by FDS for demonstration purposes.

7.2.2.4 Dearth of academia/trainers for specific training of professionals in aquaculture related fields

There are a few institutions, including universities delivering aquaculture related educational program. But most of these are academic in nature and conducted by persons with little practical knowledge of aquaculture. There is therefore a big disconnect between academia and the aquaculture industry and the curriculum does not match with field and practical business requirements. The dilemma is that existing aquaculture practices in Pakistan are so basic, that it does not need degree holders as work force and therefore, there are not enough jobs for them.

Lack of data and information collection system to support aquaculture management on rational lines, has already been discussed in the report earlier

7.3 Investment incentives from GOP for fisheries and aquaculture

7.3.1 Mark-Up Rate Support of 1.5 Percent on Export Finance Scheme

To ease constraints on availability of capital, it has been decided to provide a further markup reduction of 1.5 points from the prevailing rates to the following focus sectors: fish and fish preparation, processed foods, meat and meat preparations, sports goods, footwear, leather products, surgical goods, cutlery, onyx products, pharmaceuticals, electric fans, auto parts, transport equipment and electrical machinery.

7.3.2 Freight Subsidy on Export of Live Seafood Products

Government in its trade policy 2009-10 announced the grant of 25 percent freight subsidy of live seafood products that are exported by air. This will also compensate exporters to overcome losses incurred due to mortality

7.3.3 Customs General Order No. 27/99

Under the Import Policy for 1999-2000, the following items are importable under the SRO 27(I)/98 as “equipment”, by the specified industries:-

Plastic fishing crates (PCT heading 3923.1000, Fish Processing Industry, and Refrigerated Poultry, dairy farming, fishing, fruit and vegetable and commodities.

7.3.4 No Sales Tax on Exempted Items

These essential items including vegetables, meat, milk, eggs, red chilies, fish, drugs, pulses, fruits, poultry, ginger, turmeric, cereals and products of milling industry, ice, poultry feed, butter, yogurt, butter, salt, potato, onions, bread, nan, chapatti, bun, rusk and others continue to remain exempted from Sales Tax. It is also clarified that the increase in the rate of sales tax from 16 percent to 17 percent under the declaration issued under the Provisional Collection of Taxes Act, 1931 does not affect any of these items, which are exempted under the Sales Tax Act, 1990.

SECTION IV
8. Cross Cutting Areas

8.1 Livelihoods

Livelihood strategies are the range of outcomes of how people combine and use their assets to make a living given the factors that make them vulnerable and the policy and institutional context within which they live. In the past, development efforts often sought to improve services and opportunities available to categories of people e.g. fisher folk. However, the Sustainable Livelihoods approach seeks to develop an understanding of the factors behind people's choice of livelihood strategy and to reinforce the positive aspects.

Traditionally, agriculture, forestry and fishing played almost equal roles in the socio-economic patterns of the coastal communities. However, it is largely held that the decreasing availability of fresh water (damming and diversion of Indus water upstream for agriculture) and the mechanization of the fishing industry have caused fishing to become the dominant economic activity for these communities.

According to the Marine Fisheries Department (2012), fisher folk are classified as both par time fishermen and occasional fishermen with the following employment trends. According to last survey done in 2009 the distribution of fishermen as per their involvement in river or marine fisheries is given in following table. The projected increase in their relative abundance in 2014 could be as much as 10 percent more for each category.

Year	Marine		Inland	
	Sindh Coast	Baluchistan Coast		
2007	102,875	43,865	168,261	
2008	103, 946	44, 760	170,314	
2009	106,652	46,335	173,593	

It is of note that despite a ban by the EU in 2007, and the loss the EU as a market, the number of persons employed increase between 2007 and 2009. Quantification of the number of persons employed in Sindh can be taken as the number of boats times the crew size:

4000 boats x 20 man crew: estimated 1 lakh persons employed

A sample community of fisher folk from Salehbad was interviewed. The area comprises 300 households and approximately 7000 residents who are fully dependent on earnings from fishing.

As per interview the community has no (i) No stable revenue and (ii) would like to be engaged in alternative livelihood other opportunities e.g. search and rescue operations and lifeguard duties in which they are informally involved.

There is no involvement of the women in fisheries at the expedition level. In this community there was no involvement by women in the processing sector either and other than some occasional stitching they had no alternate earning means. When asked, about reasons for not going out and seeking work two conflicting answers emerged. Males claimed that women do not work due to lack of education, while the women members claim they do not work because its culturally frowned upon by the men. When interviewed the women indicated that the cost of their monthly expenses came to around PKR 30, 000 every month .On the assumption that there is no steady revenue stream from fishing by the men, and no attempt to search out other work by

women, the opportunity cost if not working for cultural reasons was minimum PKR 30, 000. To a question that why trash fish production is on the rise, they underscored several attributes – ranging from design of holds, no freezing capacity to mesh sizes and accepted practice. All came back to if you pay, it will change so the question is that how we encourage change.

8.2 Role of Women in the Fisheries Sector:

Unlike other agricultural and agro-processing sectors, the role of women in the fisheries sector is less visible. Given the absence of on-ground formal data, the study has used as a baseline a source document titled “The Role of Women in Fisheries” prepared by the DG Fish EU. The main findings of the baseline were that in spite of intra-EU cultural and economic diversity, the position and perception of women regarding the fisheries sector presents a considerable degree of commonality. Women felt unwelcome in the seagoing fishing sub sector, but also demonstrated little interest in participating. In aquaculture women felt discriminated against, but to a much lower extent. Processing was the one sub sector where women were over represented, mainly because they predominated in low-grade unskilled jobs. Women have made significant inroads into the management/administration segment, both of which are more rewarding and viewed in a more positive light. Finally, the role of women as support to seagoing spouses was found to both very important and highly undervalued by the fishing community. Using the above as a baseline it was found through interviews in the community that the following held true for women employed in the sector in Pakistan i.e. no participation at sea-going level. Of the community interviewed in Manora, the women did not work in either the fishing or processing activities but were easily accessible and were knowledge about fishing practices issues. In the processing sector, women are predominantly employed in the shrimp peeling industry. During consultations it was observed that no official study or data viable at either FAO or other level on the role of women in the processing set-up at the peeling sheds auction halls in Karachi or conditions in harbors and peeling sheds. The women factory workers interviewed worked in the Korangi area and belonged to the Bengali community residing in Ibrahim Hyderi. They were employed as contract employees and were involved in packing activities. The scope for promotion was limited in view of the lack of educational skills The interviewee reported that in terms of pay, no differentiation was found between the male and female workers. However, this needs to be verified from independent sources. The study was informed that revenue earned by the factory workers averages Rs 15, 00 per month which is the same as the male workers, they receive medical expense and are provided transportation to work. However, there is a high incidence of health hazards on account of “Gotha” substance chewing.

SECTION IV

9. Conclusion and Recommendations

9.1 Shrimp Aquaculture Development and Promotion

- In almost all maritime countries, marine as well as land based- aquaculture has proliferated and became a major source of raw material for the export of seafood commodities. In the absence of a major aquaculture sector such as shrimp culture in Pakistan it has not been possible to compete with nations which have this alternative and dependable source of raw material for export.
- The situation is alarming as all studies indicate that marine resources are depleting and the marine fish/shellfish are reducing day by day
- The land resources adjacent to coastal areas need to be exploited both in Baluchistan and Sindh, particularly those lands which are barren and marginally productive waste lands for development of aquaculture, particularly , shrimp aquaculture systems by the private sector. Further opportunities need to be explored/developed for attracting corporate farming.
- The potential for both shrimp and freshwater prawn farming in coastal areas of Pakistan is evident from a number of reports and studies conducted in past, both by national and international consultants and organizations. In fact, shrimp-farming opportunities was established early as 1980 by Asian Development Bank (ADB) through its famous research based studies in Pakistan which was published as Status of Aquaculture and Fisheries in Pakistan by FAO/ ADB jointly.

  In historical perspective, the following were the earlier follow ups in this regard;

- In 1982, the Department of Fisheries (DOF), Government of Sindh started a pilot project for shrimp farming in Thatta District with the financial assistance of the Asian Development Bank. It consists of 56 ha of nursery and grow-out ponds with a water pump to lift water to the ponds from the nearby creek. Unfortunately, this project was not successful because of simple reason that the experts who were to transfer the technology of shrimp farming had to leave Pakistan before their mission could have started due to administrative delays and improper implementation.
- Private parties like Lipton (Pvt) Ltd also tried shrimp culture in this area, but were not successful due to non-availability of baby shrimp from hatcheries , Actually no hatchery existed then so for stocking the ponds the baby shrimp were imported from Thailand which was not economically viable ,
- Most tropical penaeid shrimp species grow best within a temperature range of 28 to 32°C, however, this does not mean that appropriate strategies for shrimp culture cannot be devised.

- The Indus delta region has good potential for the aquaculture of marine shrimp. There are about 385,000 ha of inter-tidal lands available which can be converted into shrimp ponds at a very low cost Likewise is the potential in Baluchistan coastal areas
- The Government of Sindh planned in 80's to earmark as much as 6,400 ha of land for shrimp culture in Thatta and adjacent areas for allocation to private sector on long term lease basis for developing shrimp farms but due to lack of a viable land lease policy, to date, this policy could not get implemented. A number of attempts have been made to materialize the land lease policy for shrimp farming in Sindh but all affords so far are in vain.
- As a result of having no land lease policy in Sindh, The private sector cannot start investing into shrimp farming endeavors .

9.1.1 Recommendation -Step 1.

The Board of Investment is in a position where it can be effectively instrumental in finalizing the land lease policy of Sindh with taking the matter vigorously with Government of Sindh as step one towards breaking the stalemate against start of shrimp farming in private sector.

9.1.2 Recommendation -Step 2.

The aquaculture sector has received a substantial amount of government investment over the past decade. Aquaculture and Shrimp farming project program funded by PSDP have supported the development and facilities such as those at two Shrimp Hatcheries at Hawks Bay , now working under Government of Sindh and Marine Fisheries Department. The SFD can rationalize their shrimp hatchling production program by coordinating with relevant departments to enter into shrimp juvenile production for stocking in sea waters till the private sector farms are created , . This will also promote and provide the basis for starting a shrimp aquaculture production system in Pakistan

The third shrimp Hatchery is under completion at Pasni , Baluchistan. Their function can also be brought into national shrimp network when completed

9.1.3 Fin Fish Aquaculture Promotion and Development

- This is also a fact that finfish aquaculture began in Pakistan as a small-scale side line of crop farmers; however, with the emergence of fish hatcheries operated by the public sector, there is a movement towards larger fish farms particularly with the entry of business men into this sector. This effect, however, is area specific and confined to areas close to big cities such as Lahore and Multan as well as in Sindh where people have large land holdings.
- In fish culture system the biggest limitation is the non-availability of fish feed on commercial level. Private sector is shy to invest into fish feed mill simply because the economic viability of fish feed mill as the fisheries departments in the two major provinces failed to convince the private sector farmer about enhanced production and to commensurate with it would be the increased income from farms which use the pallet feeds .

9.1.4 Recommendation -Step 3.

(Promotion of New and Exotic Species Aquaculture)

- *The new species a*quaculture such as Tilapia, Pangassius and Channel Catfish and trout as well as freshwater giant prawn warrants immediate attention from the organizations such as BOI for initiation of corporate aquaculture in Pakistan

9.1.5 Recommendation -Step 4.

- A pilot feed mill project needs to be initiated with public private partnership to demonstrate the profitability of the farming systems using feeds. BOI can look for joint venture ship in this area

9.1.6 Mariculture

Immense potential exists for start of cage and pen culture in off-coast areas of Arabian seas, particularly in predetermined feasible areas such as in and around Korangi, KT Bandar , Zero point (all near Karachi) and Dam, Pasni, Kalamat bay , Astola Island .

9.1.7 Recommendation -Step 5.

- Support for initiation of high value Mariculture in seas of Pakistan at Corporate level
- The investment opportunities need to be exploited by opening doors for international investment through development on corporate lines by providing incentives such as tax holiday, duty free import of equipment's, hiring services of expert expatriate with income tax free salaries, friendly export policy for the produce and guaranteed provision of safe heavens.
- Promotional activities encouraging an incentive-based policy development for starting joint ventures.

9.1.8 Man-Made Reservoir& Freshwater Lake Fisheries Management

9.1.9 Recommendation -Step 6.

The need to increase development of inland fisheries in both large man-made dams and allied canal systems should be one of the major task for Fisheries Department Sindh. It is recommended that in this connection they should constitute a Technical Advisory Committee of fisheries experts, engineers from Irrigation Department and WAPDA. And for this a comprehensive strategic plan, to optimize reservoir fish yields through culture-based fisheries and related activities in major lakes and reservoirs needs to be developed using the international expertise/services and networking with international organizations such as World Fish Centre (WFC) and Network of Aquacultures in Asia (NACA), USAID etc. The strategic Plan should focus on; Development of an effective method(s) for data collation leading to the maintenance of a national database that could be utilized for furthering effective co-management of reservoir fisheries with private-public partnership. An integral part of this stagey should be to improve the capacity of participating partners to rationally manage reservoir fisheries.

9.1.10 Recommendation -Step 7

Recommendations on policy changes required to sustain and improve fish food production in reservoirs and lakes along with a "Better Practice Model" for market and quality infrastructure development.

9.1.11 Sustaining Marine Fisheries in Coastal Areas of Sindh

The Marine capture fisheries production in Pakistan, if not on overall decline, is showing alarming signs of reduction in catches of fish and shrimp of economic importance. The sustainability issues is a challenge mainly because the resource is "open access" (anybody with a boat and/or vessel can enter into the fishing zone without any restriction or licensing)and the rules to regulate the type of fish catching nets (gears) and fishing grounds are not manageable by the authorities .'

Decline in fish/shrimp production, lack of value added fish/shrimp export, quality control and rejections of export at the port of arrival are the main issues.

9.1.12 Recommendation -Step 8.

Two pronged strategy can be facilitated.

For rational and judicious utilization of revamped (by FDB) Sindh Government Shrimp Hatchery as well as Marine Fisheries Department's Fish/shrimp hatchery , Sindh Fisheries department should embark on a shrimp juvenile production program by coordinating with relevant hatcheries and providing them with technological services of foreign experts (of NACA, FWC , or SEAFDEC, and USAID linked academia and Fisheries services) to immediately enter into shrimp juvenile production for stocking in sea waters. For open water stocking it would be essential to determine first the feasible sites for selection, in open sea.

The boat (for fishing) building industry is in Pakistan has developed considerably and attained landmark position in development stage. The entry of new boats therefore into open seas of Pakistan is going unchecked. The NOI can link the boat builders association of Pakistan to potential, new markets in region like Iran etc.

SFD may organize and arrange international visits of potential international buyers from the local (Pakistani) boat industry not only for attracting new orders but also for encouraging joint ventures .

For conservation stocks a program needs to be followed systematically for changing of the fishing fleet to long line method to catch tuna / Swordfish / Mahi Mahi / Shark for high value Japanese markets.

9.2 Cross Cutting Areas of Fisheries Development

9.2.1 Recommendation -Step 9.

Of Women Associated With Fisheries Sector

In Pakistan, the participation of women in fisheries is common among the fishing communities but among fish farmers, women usually do not participate in the business when it is an independent company. However, women are engaged in aquaculture activities when it is part of a family enterprise and help is required in feeding, planting grasses in the ponds and guarding the ponds when the farm is close to the house. BOI should publicize and facilitate the women fisher folks of the country for initiation of international donor assisted programmer for their skill development and increased income opportunities

Recommendations would require the Formation of WCOs (Women's community Organization's and Training to look at local issues such as healthcare and education, Vocational training in handicrafts and other means of income and Skills training for women factory workers.

9.2.2 Recommendation -Step 10.

Development of Fish Trade Corridor

Trade related development is essential for export development. The Concept of "Trade Corridor" approach needs to be developed with one widow operation from a designated port. Ideally to implement this approach, The BOI should work towards developing the first ever National Fisheries Trade Corridor" at the Korangi Fish Harbor on the lines of one recently developed in Indonesia.

In developing such an strategy, the services and technical assistance and support from the USAID and allied American Institutes/organization would be very helpful. .

9.3 Adding Value to the Fisheries Products

Pakistan's fishing industry is a growing sector and to develop the industry further and obtain a larger share in the world market the development programs needs to follow a series of interventions with a missionary spirit for putting up a set of recommendation in place to 'add value' to product and process in the fisheries sector of Pakistan.

Potential areas for value addition in the fishery sector based on meetings/visits and discussions, the mission deemed practical to focus on companies in the private sector with the determination and the funding to make some of these value addition projects actually happen. Three areas identified for future development of the processing sector included.

9.3.1 Recommendation -Step 11

A two-pronged strategy is needed to promote and develop value added products in Pakistan and for which it is recommended that the following products as worked out by the TRTAII program of UNIDO may be used as guide line for added Product –based Industrial Development through providing technical assistance to the investors in the private sector for pilot scale development .

9.3.1.1 Value added production system

Potential areas for value addition in the fishery sector based on meetings/visits and discussions with private sector entrepreneurs, heads of government institutions, fishermen and other stakeholders, both in Baluchistan and Karachi (Sindh).

- Use of Fish oil based by-product as raw material in pet food industry.
- Refinement of crude heat-treated fishmeal oil, currently obtained while preparing fish meal
- Block processed sardines for export in human consumption sector, (de-headed and de-tailed or whole-fish)
- Canning large sized sardines in oil, especially in Gwadar because of availability of high quality sardines from pollution-free waters.
- Product development from deboned minced white fish such as ribbon fish and bream
- Supply of minced fish wastes in frozen bulk for Mink-feed and pet-food
- Drying of fish for Nigerian human consumption markets
- Smoking fish (cold smoked) such as Mackerel, Tuna etc.
- Feasibility of using Squids for fishing bait especially in Norway , Iceland or for sport fishing
- Crab and Prawn shell based chitin / chitosan products

9.3.1.2 Market Development for Value Added Products

- Review of opportunities of existing fish species and by product of Pakistan for potential export and their connectivity with buyers
- Presentation and discussion with south east Asian, Russian markets
- Planning of visits and buyer/seller meets to materialize the business
- Technical support/review signing agreements for business, business plans for joint ventures and pilot shipment'

It is strongly recommended that for the above two approaches to be fulfilled the Sindh Fisheries Department in association with PAKFEA and Local Chambers can play a vital role by providing Support in plant upgrading as part of pilot projects provided contributory investment is made by the processor or local community or through international grant /assistance from organizations like USAID

9.3.2 Marine Products Fish Market Development.

9.3.2.1 Recommendation Step 13-15.

Landing site/ports (Karangi, Karachi, Baba Bhit, Ibrahim Hydri and other landing jetties).

Recommendations for improvements to the local fish harbor /ports include:

- **Korangi:**

a. To open the closed market area providing facilities such as chilling, cleaning and fish handling systems (box system) by construction/modifying the existing jetties and auction hall (falls in the Federal Government domain presently).

b. Efforts on the part of Sindh Government is needed (Through CCI) for logical transfer of Korangi Fish harbor to Sindh Government giving full justification For harmonizing fish port activities in Sindh.

c. Karachi: Comprehensive chilled market area with cleaning facility and fish handling systems is needed.(Can be Achieved by following the new Master plan for Carchi Fish Harbor by FDS). Likewise congestion at Karachi harbor needs to be reduced by restricting number of boats to be parked here.

- Baba and Bhit Island and other Landing sites (so called unauthorized landing sites also need well designed Landing area with chilled market facility and fish handling systems need incorporating with best handling practices

- Unauthorized fishing harbors should be completely surveyed and brought into the administrative net of FDS insofar as their control on SPS and other hygiene and relevant infrastructure facilities are concerned. Subsequently a policy needs to be devised or their legalization /authorization.

9.4 Rehabilitation/Enhancement of Fish Stocks for Sindh Inland Capture Fisheries

Sindh Fisheries managers have a number of options for fishery development in the their part of riverine system consisting of canal systems and lakes. Actually these options are a response to the impacts caused by the manipulation of water resource for purposes other than fisheries. Predicting pre-hand the weather pattern for each year is important as the riverine system as a whole is subject not only to rainfall, but in some places also ambient air temperature, which determines the amount of snow- and ice-melt from glaciers up north, and evaporation rates. Agricultural requirement of water varies from year to year based on cropping pattern and this leads to the tremendous variation in the amount of alter which ultimately goes into the sea from Sindh. There is also usage of pesticides.

9.4.1 Recommendation- Steps 16-18

- The FDS must prepare an overall master plan for Fisheries Management in riverine and reservoirs system of Sind along with a contingency plan for fisheries managers,

- Fishery sector is usually underfunded by the government. The resources, even with short supply of fund must be allocated for a well-organized research and collection of statistics obtained through regular monitoring of fish stocks, so that the impacts of

introductions, stocking, and catches could be evaluated and management strategies adjusted.
- Centralized statistics collection systems need to be established to provide time-series of data for rivers, streams and reservoirs/lakes for assessment, evaluation and examples of the level of efficiency of the applied enhancement measures.

9.4.2 Aquaculture/Capture Fisheries Products Market Development

It is estimated that post-harvest losses from river capture fisheries are 20 percent. Inferior handling and distribution, inadequate infrastructure and poor marketing practices characterize the marketing system

9.4.2.1 Recommendation- Steps 19-23

- Development of a market Intelligence system within FDS as nerve center for receiving firsthand information on day to market behavior and consumers response to correct day to day market functioning in key fish markets,
- A master plan for developing market infrastructure should be developed by highly skilled fish market specialists. The master plan should be in phased form so that it could be implemented in phases due to limited finances available with the Government , May be the FDS can approach international Development Agencies for financial/technical support for this endeavor.
- Capacity building of FDS in regulating fish markets in accordance with the emerging trends in aquaculture
- Introduction of tractability system and implementation AQUAGAP for selected Fish Farmers for introduction of their farming products in international market
- Training of Fishermen and fish farmers in proper fish handling techniques and post-harvest processing, like icing, grading and then some should be supported for going for adopting Branding option for their fish farming produce
- No value adding exists in framed fish products. A comprehensive study based feasibility report s are needed for prioritized value added aquaculture products so that investors have firsthand information to opt for go into high- value- high risk investment in Aquaculture .

9.5 New Inland Fisheries Policy for Sindh.

9.5.1 Rationale

Policies regarding fisheries have always been designed by the federal government. Provincial governments (like Sindh) must frame their own policies keeping in view the socio-economic conditions of their respective jurisdiction. There is a genuine feeling that Policies made by federal authorities have never addressed the real issues of the fish farmers and fishermen seriously and have only added to their miseries because they are unaware of the ground realities. Hence there is an immediate need for the Province of Sindh to devise its new policy on Fisheries that should have strings which could pulled together for the betterment of overall fisheries sector stakeholders and its ultimate beneficiary , the people of Sindh.

9.5.2 Recommendation Step 24

The elements of Policy should include, beside other issues, the following at least

It is imperative to note that the current policy of public sector in Sindh has failed to protect the fisheries from unabated stock depletions due to irrational fishing. This has affected the overall productivity of natural waters which, therefore, needs to be augmenting its productivity. A rational and implementable fisheries conservation and management policy needs to be delineated individually for special water bodies like lakes, man-made reservoirs so as to

gradually optimize their fish productivity on sustainable basis. The policy should then continue with a rational action plan, which should include the human resource development as one of its key components.

A policy is also needed to integrate the interventions that could arrest the deterioration of Badin which has turned into the most devastated area for the fishing community; sea intrusion has wreaked havoc in that region. The faulty drainage schemes including LBOD and RBOD have exacerbated environmental degradation in the fishing catchment areas of lower and upper Sindh. In Thatta and Badin, sugarcane mills are also destroying groundwater and polluting the fishing catchment areas and there is a worrying silence at the government's end on the issue May be there are too many government agencies involved in dealing with the issue with their own perspective .

A cohesive policy on the issue can benefit the fishing community the most. A policy is needed, as well, on the issues of compensation and rehabilitation of fishermen community on forced/ inevitable natural calamity prone displacement as were the effected of the Chotiari Dam in Sanghar.

There is also no policy on livelihood source of fishermen during close season. The civil society, the representative body of exporters and some respondents have s identified the following key gaps in the policy framework:

Acceleration in exploitation amidst confirmed reports of drastic reduction in fisheries resources. Abatement of the much-criticized open entry policy in fisheries model.

TWO MODEL PROJECTS

While detailed plan of action is needed for the implementation of recommended steps, the logical conclusion for where USAID could be going from here helping sustainable aquaculture development in in Sindh (two Possible areas of intervention).

As per the present reports two critical areas in aquaculture, this warrants immediate attention for development of the sector and further rational growth. Subsequently two Projects are worth consideration of USAID on immediate basis in collaboration with any relevant university in USA and the Fisheries Department Sindh for immediate start up on the following lines

Project **#** 1; "Improving Competitiveness of Sindh aquaculture through capacity building, improved technology, and management of supply restraint and natural resources" (one similar project is underway in Ghana, Kenya and Tanzania sponsored by USA with collaborating US universities: VT (Frimpong); UAPB (Rebecca Project#2 Lochmann)

Project # 2; "Technology Adoption & Policy Development for Aquaculture

10. Appendices

Appendix -1 List of Stakeholders Interviewed

INSTITUTION	Stakeholders Consulted
Marine Fisheries Department	DG and other Senior officials
Sindh Fisheries Department	DG Sindh Fisheries Department and Deputy Director
Korangi Harbor Authority	MD Korangi Fish Harbor Authority.
Sindh Wildlife Department	Conservator Sindh Wildlife Department
Sindh Forestry Department	Director Forestry
Sindh EPA	Director EPA Sindh
Coastal Development Authority of Sindh	Director Sindh CDA
UNIDO	Programme Officer Value addition (TRTAII programme)
IUCN	Mr. Tahir Qureshi
TDAP	Director , Livestock and Fisheres Exports , TDAP
WWF	Dr. Moazzam Khan Consultant
PFEA	Director , PFEA
Mehran Fisheries	Chairman
Aqua Pearl Fisheries	Proprietor Aqua Pearl Fish Processors.
Manora Island residents(Baba and Bhit Island precisely)	Fishermen Educational Society
FAO	Mr. Paul Fanning CTA Fish Stock Assessment Survey

11. References

1. Akhtar, N.2001. Strategic planning for inland fisheries and aquaculture sector in Pakistan. In proceeding of National Seminar on strategic planning for Fisheries and Aquaculture in the new Millennium. Karachi.
2. Akhtar , N. (2003) Sustainable Fisheries . National conservation Strategy for Pakistan , IUCn/ Ministry of Environment GOP . 2003
3. Akhtar, N., (2009). A multi-level examination of quality-focused human resource practices and firm performance: evidence from the US healthcare industry. *International Journal of Human Resource Management*, *20*(9), 1945-1964. doi:10.1080/09585190903142399**.**
4. Akhtar, N., (2009). /FAO (2002). FAO Expert consultation on the use of irrigation systems for sustainable fish production in arid countries of Asia. FAO Fisheries Report No. 679, Rome, 22p.
5. FAO.2003. Investment potential on inland fisheries and freshwater aquaculture project (UTF/PAK/ 092).Report No. 03/063 CP-PAK
6. FAO (2003a). Fisheries in irrigation systems of arid Asia. FAO Fisheries Technical Paper 430, Rome, 150pp.
7. FAO (2003b). Selected Indicators of Food and Agriculture Development in Asia-Pacific c Region 1992-2002. RAP Publication 2003/10, Bangkok,207pp.
8. FAO (2004). The State of World Fisheries and Aquaculture 2004. Rome, Italy 153pp.
9. FAO (2007). The State of World Fisheries and Aquaculture 2006. Rome, Italy 162pp.
10. FAO. 2011. Aquaculture production, 2011. Year book of Fishery Statistics - Vol.103/2. Food and Agriculture organization of the United Nations, Rome, Italy. Government of Pakistan. 2005. Overview: Medium Term Development Framework 2005-10.
11. FAO.2003 . Investment potential on inland fisheries and freshwater aquaculture project (UTF/PAK/ 092). Report No. 03/063 CP-PAK.Government of Pakistan. 2005 . Overview: Medium Term Development Framework 2005-10.
12. George, W. 1992. Review of inland fisheries of Pakistan. FAO Fisheries Report No. 458, Suppl.: 47-81. Rome, FAO.

13. George, W. 1995. Review of fishery management in Water and Power Development Authority (WAPDA) reservoirs in Pakistan. FAO Fisheries Report. No. 512, Suppl.: 141-153. Rome, FAO.

14. Jarwar, A.M.A. (2006). Water-logged areas for fish farming. In Daily Dawn Karachi, January 16,2006.

15. Jarwar, A.M.A. (2009). Fisheries development potential - Pakistan . Asia Pacific magazine

16. Melba, R.2005. Coastal Areas of Sindh- Assistance for Project Formulation. Unpublished report.

17. Petr, T., 1999. Coldwater fish and fisheries in Pakistan. FAO Fisheries Technical Paper. No. 385: 122-137. Rome, FAO.

18. Sultana, G.2004 . Strengthening of fish handling, processing and quality assurance. FAO, TCP/PAK/ 2904-A**.**

19. Wasim. M.P., (2007) Spatial – temporal analysis issues, growth and instability of inland

20. Fish production in Sindh (Pakistan). *Pak. Economic and Social Review;* 45, No. 2 pp. 203-230

21. Yaqoob, M.1994 .The aquaculture of freshwater prawns, Macrobrachium malcolmsonii (Milne Edwards), at farmers' level in Pakistan. Aquaculture and fisheries management 25, 355-361.

22. “The Role of Women in Fisheries” by MacAlister Elliott and Partners Ltd (MEP) and was prepared by DG Fishhttp://ec.europa.eu/fisheries/documentation/studies/role_of_women/summary_en.dff

USAID Firms Project
info@epfirms.com